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BY

D. R RAGGE

British Museum (Natural History)

Pp. 1–17 ; 32 *Text-figures*

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A REVISION OF THE GENERA *PHLAUROCENTRUM* KARSCH, *BUETTNERIA* KARSCH AND *LEIODONTOCERCUS* CHOPARD (ORTHOPTERA : TETTIGONIIDAE)

By D. R. RAGGE

CONTENTS

SYNOPSIS

The genera *Phlaurocentrum* Karsch, *Buettneria* Karsch and *Leiodontocercus* Chopard are fully revised. A new genus is described, based on a species previously included in *Phlaurocentrum* Karsch. One generic and one specific synonym are newly established, and five new species are described.

INTRODUCTION

The genera *Phlaurocentrum* Karsch, *Buettneria* Karsch and *Leiodontocercus* Chopard form a fairly homogeneous group of Phaneropterinae, very similar in all important respects and doubtless of monophyletic origin. The group may be characterized by the presence of a well-developed fore coxal spine, a vertex with a compressed fastigium, and fore tibial tympana that are conchate internally and open externally; the females have a hood-like tenth abdominal tergite, which completely conceals the supra-anal plate, and a greatly reduced, smooth-edged ovipositor.

The genus *Phlaurocentrum* Karsch has hitherto contained three species. One of these, *Ph. stigmosum* Karsch, was found to be generically quite distinct from the remaining two (and from the three new species described here); this species forms the basis of the new genus *Myllocentrum* gen. n., which links the group of genera mentioned above to *Enochletica* Karsch (see p. 16).

Throughout this paper "Congo Republic" refers to the former Belgian colony. The author's usual conventions are observed (see Ragge, 1957, p. 124) and the wing-vein nomenclature used is that of Ragge (1955).

ACKNOWLEDGMENTS

I must extend my most sincere thanks to the following specialists who have been kind enough to send me type specimens and other material from their respective museums :—

Mr. P. Basilewsky, Dr. M. Beier, Mr. R. H. Carcasson, Dr. L. Chopard, Dr. K. K. Günther, and Mr. D. C. Rentz.

I am particularly grateful to Dr. N. D. Jago, who has most kindly sent me specimens collected by him personally.

I also wish to thank Mrs. P. M. Newman for her practical assistance.

MATERIAL

In addition to the collection of the *Phlaurocentrum* group in the British Museum (Natural History), material was lent by the sources listed below, through the courtesy of the specialists mentioned above (the abbreviations used where the material is listed in detail are inserted in parenthesis).

Musée Royal de l'Afrique Centrale, Tervuren (Mus. Af. Cent.) ; Naturhistorisches Museum, Vienna (Nat. Mus. Vienna) ; Coryndon Museum, Nairobi (Coryndon Mus.) ; Muséum National d'Histoire Naturelle, Paris (Mus. Hist. Nat. Paris) ; Zoologisches Museum of the Humboldt-Universität, Berlin (Zool. Mus. Berlin) ; California Academy of Sciences, San Francisco (Cal. Acad. Sci.).

KEY TO THE GENERA

1. Fastigium of the vertex relatively broad, as in Text-fig. 2. Hind femora less than half the length of the fore wings. Ovipositor upcurved, as in Text-fig. 5 ***MYLLOCENTRUM*** gen. n. (p. 15)

–. Fastigium of the vertex relatively narrow, as in Text-fig. 1. Hind femora more than half the length of the fore wings. Ovipositor not upcurved, as in Text-figs. 3 and 4 . 2

2. Fore wings long and narrow, as in Text-fig. 12. Hind femora more than three-quarters of the length of the fore wings . . ***LEIODONTOCERCUS*** Chopard (p. 13)

–. Fore wings relatively shorter and broader, as in Text-figs. 6–11. Hind femora less than three-quarters of the length of the fore wings 3

3. Costal area of the fore wings abruptly constricted about halfway along their length by an emargination of the anterior wing-margin, as in Text-fig. 11. Ovipositor as in Text-fig. 4 . . . . ***BUETTNERIA*** Karsch (p. 11)

–. Costal area of the fore wings not constricted in this way, as in Text-figs. 6–10. Ovipositor as in Text-fig. 3, or very similar . . . ***PHLAUROCENTRUM*** Karsch (p. 4)

PHLAUROCENTRUM Karsch, 1888

Phlaurocentrum Karsch, 1888, *Berl. ent. Z.* **32** : 445. Type-species, by monotypy, *Phlaurocentrum latevittatum* Karsch, 1888.

DIAGNOSIS. ♂♀. Fastigium of vertex compressed, not or hardly sloping to frons, sulcate above. Fore wings of moderate breadth, obliquely truncate apically, as in Text-figs. 6–10. Male subgenital plate with pair of styles.

DISCUSSION. This genus differs from *Buettneria* Karsch and *Leiodontocercus* Chopard in the shape of the vertex, in the presence of styles on the subgenital plate of the male, and in the structure of the ovipositor (cf. Text-figs. 3 and 4).

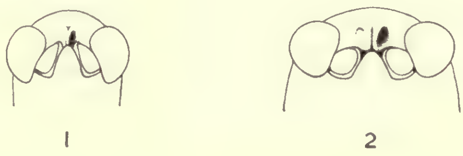
The species described under the name *Phlaurocentrum stigmosum* Karsch, 1896 differs in several important respects from *Ph. latevittatum* Karsch and the remaining four species included in the genus in this revision ; these differences make it impossible to retain this species in *Phlaurocentrum* Karsch, and I am erecting for it the genus *Myllocentrum* gen. n. (described on p. 15).

DISTRIBUTION. This genus occurs throughout the forested parts of Wallace's West African Sub-region, and also extends into Uganda.

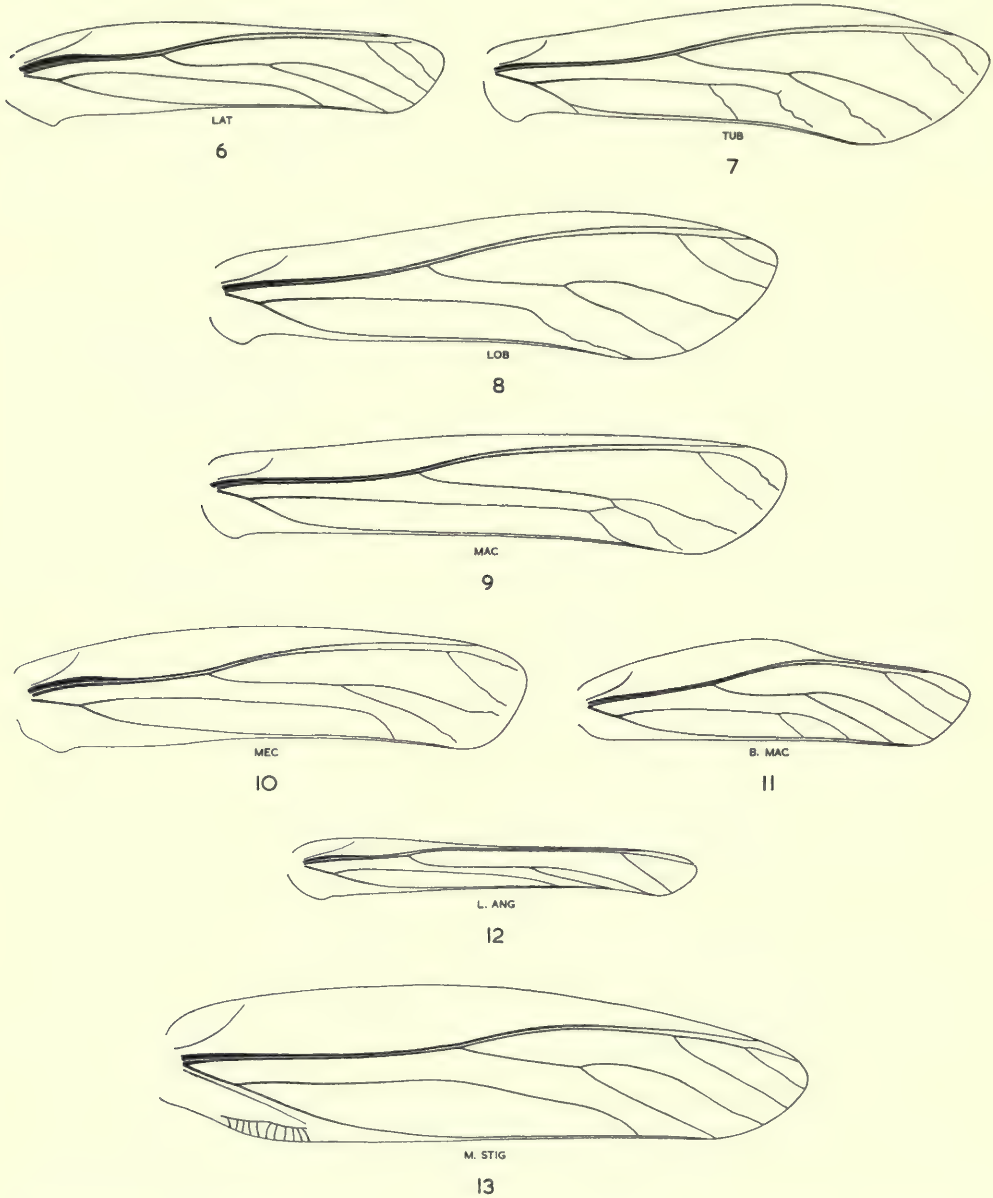
KEY TO THE SPECIES OF *Phlaurocentrum*

The features of the male subgenital plate, on which this key has to be almost entirely based, cannot, unfortunately, be expressed in words, and reference must be made to Text-figs. 14–18. Although the females lack any striking diagnostic characters it may be possible to make a tentative identification of specimens of this sex not associated with males by reference to Text-figs. 28–31.

1. Tenth abdominal tergite as in Text-fig. 17 . . . **Ph. maculatum** sp. n. (p. 10)
–. Tenth abdominal tergite not as in Text-fig. 17 2
2. Tenth abdominal tergite as in Text-fig. 18. Upper part of the lateral lobes of the pronotum black, contrasting with the pale pronotal disc **Ph. mecopodoides** Karsch (p. 11)
–. Tenth abdominal tergite not as in Text-fig. 18. Pronotum not coloured as above . 3
3. Tenth abdominal tergite as in Text-fig. 16. . . . . **Ph. lobatum** sp. n. (p. 9)
–. Tenth abdominal tergite as in Text-figs. 14 or 15 4
4. Tenth abdominal tergite as in Text-fig. 14 . . . **Ph. latevittatum** Karsch (p. 7)
–. Tenth abdominal tergite as in Text-fig. 15 . . . . **Ph. tuberosum** sp. n. (p. 8)



FIGS. 1–5. The *Phlaurocentrum* group. 1–2. Anterior view of the dorsal part of the head of (1) *Ph. latevittatum* Karsch ; (2) *Myllocentrum stigmosum* (Karsch). 3–5. Lateral view of the ovipositor of (3) *Ph. tuberosum* sp. n.; (4) *Buettneria maculiceps* Karsch (*Leiodontocercus* Chopard is very similar) ; (5) *M. stigmosum* (Karsch).

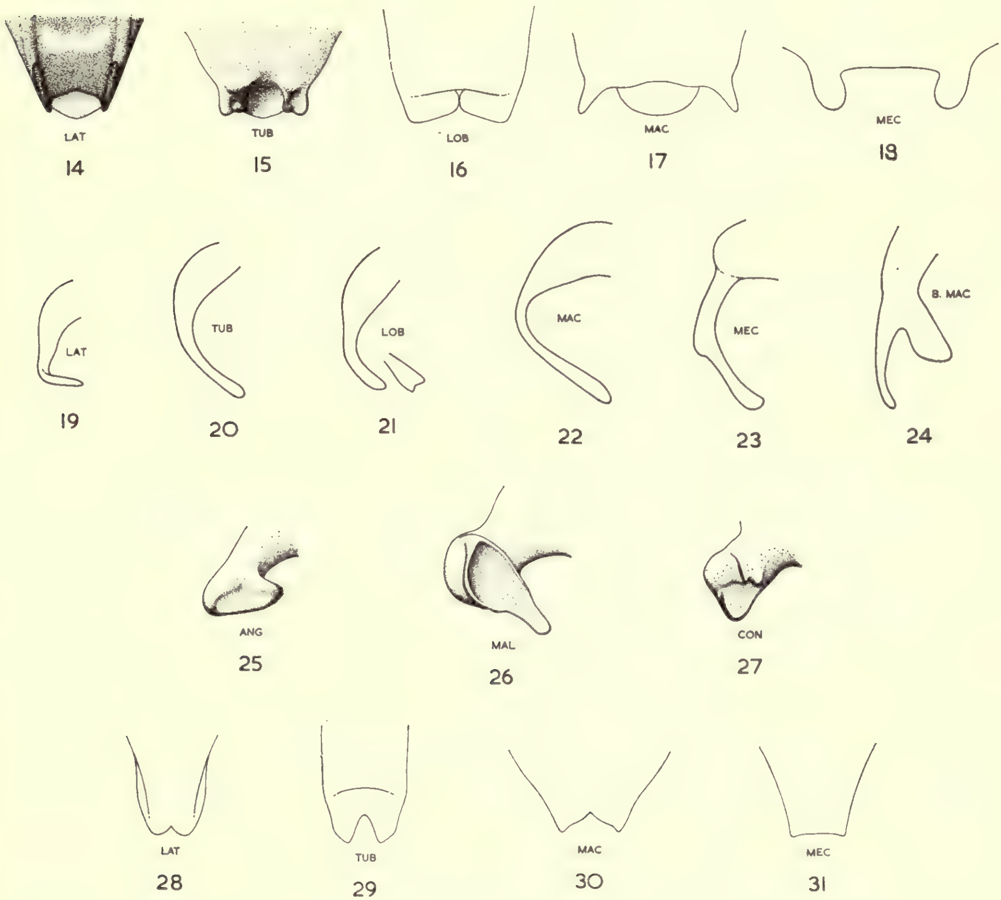


FIGS. 6–13. The right fore wing (male in all cases except *Myllocentrum stigmosum* (Karsch)) of (6) *Phlaurocentrum latevittatum* Karsch ; (7) *Ph. tuberosum* sp. n.; (8) *Ph. lobatum* sp. n.; (9) *Ph. maculatum* sp. n.; (10) *Ph. mecopodoides* Karsch ; (11) *Buettneria maculiceps* Karsch ; (12) *Leiodontocercus angustipennis* Chopard ; (13) *Myllocentrum stigmosum* (Karsch) (female).

1. *Phlaurocentrum latevittatum* Karsch, 1888

Phlaurocentrum latevittatum Karsch, 1888, *Berl. ent. Z.* **32** : 446. Holotype ♀, Congo Republic : Kuako to Kimpoko (*Büttner*) (probably lost—see below).

Diagnosis. ♂. Tenth abdominal tergite as in Text-fig. 14. Cerci as in Text-fig. 19. ♀. Subgenital plate as in Text-fig. 28.



Figs. 14–31. The *Phlaurocentrum* group. 14–18. Dorsal view of the male tenth abdominal tergite of (14) *Ph. latevittatum* Karsch ; (15) *Ph. tuberosum* sp. n.; (16) *Ph. lobatum* sp. n.; (17) *Ph. maculatum* sp. n.; (18) *Ph. mecopodoides* Karsch. 19–27. Dorsal view of the left male cercus of (19) *Ph. latevittatum* Karsch ; (20) *Ph. tuberosum* sp. n.; (21) *Ph. lobatum* sp. n. (with ventrolateral view of the tip) ; (22) *Ph. maculatum* sp. n.; (23) *Ph. mecopodoides* Karsch ; (24) *Buettneria maculiceps* Karsch ; (25) *Leiodontocercus angustipennis* Chopard ; (26) *L. malleus* sp. n.; (27) *L. condylus* sp. n. 28–31. Ventral view of the female subgenital plate of (28) *Ph. latevittatum* Karsch ; (29) *Ph. tuberosum* sp. n.; (30) *Ph. maculatum* sp. n.; (31) *Ph. mecopodoides* Karsch.

MEASUREMENTS

		Males	Female
Total length	(4) :	37·8–42·8, mean 40·28	43·1
Median length of pronotum	(3) :	3·9–4·6, mean 4·36	4·3
Length of hind femur	(4) :	21·4–24·6, mean 22·82	23·2
Length of fore wing	(4) :	28·4–32·6, mean 30·98	33·1

DISCUSSION. Males of this species may be easily recognized by the tenth abdominal tergite and cerci. The rounded lobes of the subgenital plate of the only female of this species that I have examined are probably also characteristic.

Through the kindness of Dr. K. K. Günther of the Zoologisches Museum, Berlin, a prolonged search has been made for the holotype of *Ph. latevittatum* Karsch, but no female specimen bearing this name has been found. There is a female specimen in spirit in that museum which has the correct locality data and which is labelled "*Phlaurocentrum fasciatum*", a name that has never appeared in print ; this specimen appears to belong to the genus *Phlaurocentrum* Karsch, but as it is completely discoloured and in very poor condition it would serve no useful purpose to regard it as the holotype of the present species. Karsch (1891, p. 321) subsequently described the male sex of *Ph. latevittatum* Karsch from a specimen from Barombi (near Cameroons Mt.) ; Dr. Günther has kindly lent me this specimen (which bears the number 5358) and I have used it to fix the identity of this species.

MATERIAL EXAMINED

CAMEROUN : Barombi, 1 ♂ (*Preuss*) (Zool. Mus. Berlin) ; Mundame, 1 ♂ (*Rhode*) (Nat. Mus. Vienna) ; Lolodorf, 1 ♂ (*Conradt*) (Zool. Mus. Berlin) ; CONGO REPUBLIC : Eala, xi.1935, 1 ♂ (*Ghesquière*) (Mus. Af. Cent.) ; 21 miles N.E. of Lusambe, 11.viii. 1957, 1 ♀ (*Ross & Leech*) (Cal. Acad. Sci.).

DISTRIBUTION. Known only from Cameroun and the Congo Republic.

2. ***Phlaurocentrum tuberosum*** **sp. n.**

DIAGNOSIS. ♂. Tenth abdominal tergite as in Text-fig. 15. Cerci as in Text-fig. 20. ♀. Subgenital plate as in Text-fig. 29.

DESCRIPTION. ♂. Fastigium of vertex compressed, sulcate above.

Pronotum without lateral carinae ; lateral lobes usually slightly deeper than long. Fore tibiae with about 5–7 external ventral spurs. Mid tibiae with about 9–10 external ventral spurs. Hind femora with about 4–7 external spines. Hind tibiae with about 17–21 external dorsal spines. Venation of fore wings as in Text-fig. 7.

Tenth abdominal tergite as in Text-fig. 15. Cerci as in Text-fig. 20.

General coloration brown, with variable amount of mottling on legs and wings and with darker brown stripe along top of head and pronotum. Sides of head, lateral lobes of pronotum, abdominal tergites and much of legs with darker brown spots. Tibial spurs and spines and femoral spines darkened. Stridulatory organ whitish or with whitish markings.

♀. As male except for wings and genitalia. Subgenital plate as in Text-fig. 29, poorly sclerotized in distal part.

MEASUREMENTS

	Males	Females
Total length	(18) : 40·5–44·5, mean 42·62	(8) : 39·9–44·4, mean 41·74
Median length of pronotum	(18) : 4·1–4·7, mean 4·45	(10) : 4·3–4·9, mean 4·51
Length of hind femur	(15) : 21·1–24·7, mean 23·37	(9) : 22·0–26·0, mean 24·13
Length of fore wing	(20) : 31·4–34·6, mean 32·89	(8) : 30·4–36·0, mean 32·09

VARIATION. The tibial spurs and spines and the femoral spines vary in number. The intensity of the dark stripe along the top of the head and pronotum varies somewhat. The distal part of the subgenital plate of the female is poorly sclerotized, and the appearance of the lobes varies quite widely in dried specimens.

DISCUSSION. The tenth abdominal tergite of the males of this species enables them to be easily recognized. The females differ in coloration from *Ph. maculatum* sp. n. and *Ph. mecopodoides* Karsch, and may be distinguished from *Ph. latevittatum* Karsch by the shape of the subgenital plate.

MATERIAL EXAMINED

Holotype. UGANDA : Mabira Forest, 3.vii.1913, ♂ (*Gowdey*).

Paratypes. UGANDA : Entebbe, 10–13.vii.1914, 1 ♂, 1 ♀ (*Gowdey*) ; Entebbe, 12–16.v.1914, 1 ♂, 1 ♀ (*Gowdey*) ; Entebbe, 10.x.1913, 1 ♀ (———) ; Entebbe, v.1952, 1 ♂ (*Pinhey*) (Coryndon Mus.) ; Kampala, 17.xi.1915, 1 ♂ (———) ; Kampala, 1–10.xii.1915, 1 ♂ (*Gowdey*) ; Kivuvu, 19.viii.1913, 1 ♂ (*Gowdey*) ; Kisaru, at light, 22.vi.1933, 1 ♂ (*Johnston*) ; Kawanda, 8.v.1942, 1 ♀ (*Taylor*) ; Kisube [?], 2.viii.1913, 1 ♂ (*Gowdey*) ; Bwamba Forest, iv.1951, 1 ♂ (*Pinhey*) (Coryndon Mus.) ; Bwamba (H.), vi.1948, 1 ♂ (*van Someren*) ; Mwera [" Urw. Moera "], 1910, 1 ♂ (*Grauer*) (Nat. Mus. Vienna) ; CONGO REPUBLIC : Kamogobe (SudMasisi), 8.iii.1936, 1 ♀ (*Lippens*) (Mus. Af. Cent.) ; Bafwarikubi, 12.ix.1912, 1 ♀ (*Christy*) (Mus. Af. Cent.) ; Tshuapa, Flandria, 19.ix.1941, 1 ♀ (*Hulstaert*) (Mus. Af. Cent.) ; Bambesa, 26.iv.1937, 1 ♂ (*Vrydagh*) (Mus. Af. Cent.) ; Bambesa, ix.1933, 1 ♂ (*Brédo*) (Mus. Af. Cent.) ; Région des Lacs, 1 ♀ (*Sagona*) (Mus. Af. Cent.) ; Mongbwalu (Kilo), 1937, 1 ♂ (*Harford-Jordens*) (Mus. Af. Cent.) ; Kivu, Kavumu to Kabunga (Mingazi), ix.1951, 1 ♂ (*Bomans*) (Mus. Af. Cent.) ; Kilo, 1 ♂ (*Abetti*) (Mus. Af. Cent.) ; Mwilambongo (Idlofa), 1947, 1 ♀ (*Rév. Soeur Imelda*) (Mus. Af. Cent.) ; Uele-Itimbiri, Dingila, 29.ix.1932, 1 ♂ (*Vrydagh*) (Mus. Af. Cent.) ; Kibali-Ituri, Geti, 1934, 1 ♀ (*Scops*) (Mus. Af. Cent.) ; Ituri, Medje, 1.iv.1914, 1 ♀ (*Christy*) (Mus. Af. Cent.) ; Luhoho, R. Bunyakiri, 1,100 m., 6.ix.1957, 1 ♂ (*Ross & Leech*) (Cal. Acad. Sci.) ; Beni Forest, ix.1947, 1 ♀ (*Gedys*) (Coryndon Mus.) ; CAMEROUN : Batouri distr., 3° 45′ N., 13° 45′ E., 750 m., 1.v–6.vi.1935, 1 ♂ (*Merfield*).

In the British Museum (Natural History) unless otherwise stated.

DISTRIBUTION. The known range of this species extends across central Africa from Cameroun to Uganda.

3. *Phlaurocentrum lobatum* sp. n.

DIAGNOSIS. ♂. Tenth abdominal tergite as in Text-fig. 16. Cerci as in Text-fig. 21 with slight indentation at apex.

♀ unknown.

DESCRIPTION. ♂. Fastigium of vertex compressed, sulcate above.

Pronotum without lateral carinae, or with slight tendency towards their formation in posterior half; lateral lobes about as deep as long. Fore tibiae with about 6 external ventral spurs. Mid tibiae with about 9–11 external ventral spurs. Hind femora with about 5–7 external spines. Hind tibiae with about 20–25 external dorsal spines. Venation of fore wings as in Text-fig. 8.

Tenth abdominal tergite as in Text-fig. 16. Cerci as in Text-fig. 21, with slight indentation at apex.

General coloration brown, with variable amount of mottling on legs and wings and with darker brown stripe along top of head and pronotum. Sides of head, lateral lobes of pronotum, abdominal tergites and much of legs with darker brown spots. Tibial spurs and spines and femoral spines darkened. Stridulatory organ whitish.

♀ unknown.

MEASUREMENTS

	Males
Total length	(3) : 46·5–47·6, mean 47·20
Median length of pronotum	(1) : 5·0
Length of hind femur	(2) : 25·8–26·6, mean 26·20
Length of fore wing	(3) : 35·8–37·9, mean 36·83

VARIATION. The tibial spurs and spines and the femoral spines vary a little in number.

DISCUSSION. Males of this species may be easily recognized by their genitalia.

MATERIAL EXAMINED

Holotype. CONGO REPUBLIC: Eala, 9–18.v.1935, ♂ (*Ghesquière*) (Mus. Af. Cent.).

Paratypes. CONGO REPUBLIC: Oshwe, xii.1913, 2 ♂ (*Maes*) (1 in Mus. Af. Cent., 1 in British Museum (Nat. Hist.)).

DISTRIBUTION. Known only from the Congo Basin.

4. *Phlaurocentrum maculatum* sp. n.

DIAGNOSIS. ♂. Tenth abdominal tergite as in Text-fig. 17. Cerci as in Text-fig. 22. Conspicuously mottled in colour.

♀. Subgenital plate as in Text-fig. 30. Conspicuously mottled in colour.

DESCRIPTION. ♂. Fastigium of vertex compressed, sulcate above.

Pronotum without lateral carinae; lateral lobes slightly deeper than long. Fore tibiae with about 6 external ventral spurs. Mid tibiae with about 10–11 external ventral spurs. Hind femora with about 8–9 external spines. Hind tibiae with about 16–22 external dorsal spines. Venation of fore wings as in Text-fig. 9.

Tenth abdominal tergite as in Text-fig. 17. Cerci as in Text-fig. 22.

General coloration yellowish brown or olive brown, conspicuously mottled and spotted with darker brown. Tibial spurs and spines and femoral spines darkened. Stridulatory organ whitish.

♀. As male except for wings and genitalia. Subgenital plate as in Text-fig. 30, poorly sclerotized in distal part.

MEASUREMENTS

	Male	Females
Total length	49·1	(2) : 41·9–42·9, mean 42·40
Median length of pronotum	5·0	(2) : 4·6–4·6, mean 4·60
Length of hind femur	25·6	(1) : 24·5
Length of fore wing	38·0	(2) : 33·2–33·5, mean 33·35

VARIATION. The tibial spurs and spines and the femoral spines vary in number.

DISCUSSION. This species may be recognized by the male genitalia and the conspicuously mottled coloration.

MATERIAL EXAMINED

Holotype. CONGO REPUBLIC: Mawambi-Irumu, 1910, ♂ (*Grauer*) (Nat. Mus. Vienna).

Paratypes. CONGO REPUBLIC: Kivu, Kalehe, Makwe, ii.1950, 1 ♀ (*Bomans*) (Mus. Af. Cent.); Mongbwalu (Kilo), 1938, 1 ♀ (*Scheitz*) (Mus. Af. Cent.).

DISTRIBUTION. This species is so far known only from the mountainous parts of Ituri and Kivu.

5. *Phlaurocentrum mecopodoides* Karsch, 1891

Phlaurocentrum mecopodoides Karsch, 1891, *Berl. ent. Z.* **36**: 321. Holotype ♂, CAMEROUN: Barombi (Zool. Mus. Berlin.).

DIAGNOSIS. ♂. Tenth abdominal tergite as in Text-fig. 18. Cerci as in Text-fig. 23. Upper part of lateral lobes of pronotum black.

♀. Subgenital plate as in Text-fig. 31. Upper part of lateral lobes of pronotum black.

MEASUREMENTS

		Males	Female
Total length	(2):	42·5–42·6, mean 42·55	40·0
Median length of pronotum	(2):	4·9–5·1, mean 5·00	5·2
Length of hind femur	(2):	24·5–24·8, mean 24·65	25·1
Length of fore wing	(2):	33·8–34·2, mean 34·00	32·6

DISCUSSION. This species may be recognized at a glance by the blackening of the upper part of the lateral pronotal lobes; the male genitalia and the subgenital plate of the female are also characteristic.

MATERIAL EXAMINED

Holotype. CAMEROUN: Barombi, ♂ (*Preuss*) (Zool. Mus. Berlin).

CAMEROUN: Mundame, 1 ♂ (*Conradt*) (Zool. Mus. Berlin); CONGO REPUBLIC: Eala, 1 ♀, ix.1930 (*Staner*) (Mus. Af. Cent.).

DISTRIBUTION. Known only from Cameroun and the Congo Basin.

BUETTNERIA Karsch, 1888

Büttneria Karsch, 1888, *Berl. ent. Z.* **32**: 444. Type-species, by monotypy, *Buettneria maculiceps* Karsch, 1888.

Stenacropteryx Karsch, 1896, *Stettin. ent. Ztg* **57**: 339. Type-species, by monotypy, *Stenacropteryx eburneiguttata* Karsch, 1896 **syn. n.**

DIAGNOSIS. ♂♀. Fastigium of vertex strongly compressed, sloping to frons, sulcate above. Fore wings broad, obliquely truncate apically, as in Text-fig. 11. Male subgenital plate without styles.

DISCUSSION. This monotypic genus differs from *Phlaurocentrum* Karsch in the shape of the vertex and in lacking styles on the subgenital plate of the male. Its much broader wings provide the only important difference from *Leiodontocercus* Chopard, of which it is clearly a close relative.

The holotypes of *B. maculiceps* Karsch and *Stenacropteryx eburneiguttata* Karsch were found to be conspecific ; *Stenacropteryx* Karsch thus becomes a synonym of the earlier name *Buettneria* Karsch.

DISTRIBUTION. Known only from Cameroun and the Congo Republic.

Buettneria maculiceps Karsch, 1888

Büttneria maculiceps Karsch, 1888, *Berl. ent. Z.* **32** : 445. Holotype ♀, CONGO REPUBLIC : Kuako to Kimpoko (Zool. Mus. Berlin—see below).

Stenacropteryx eburneiguttata Karsch, 1896, *Stettin. ent. Ztg* **57** : 339. Holotype ♂, CAMEROUN : Lolodorf (Zool. Mus. Berlin) **syn. n.**

DIAGNOSIS. ♂. Cerci as in Text-fig. 24.

♀. Ovipositor as in Text-fig. 4.

MEASUREMENTS

	Males	Females
Total length	(2) : 30·8–36·3, mean 33·55	(2) : 41·2–42·2, mean 41·70
Median length of pronotum	(2) : 3·7–3·8, mean 3·75	(2) : 4·1–4·2, mean 4·15
Length of hind femur	(3) : 17·7–18·4, mean 18·00	(1) : 20·7
Length of fore wing	(3) : 25·4–26·3, mean 25·77	(2) : 30·4–30·4, mean 30·40

DISCUSSION. As mentioned when discussing the genus, this species may be distinguished from *Leiodontocercus* Chopard by the much broader fore wings and the characteristically shaped male cerci.

Dr. K. K. Günther of the Zoologisches Museum, Berlin, who has kindly made a search for the holotype of *B. maculiceps* Karsch, has been unable to find a specimen bearing this name. There is, however, a female specimen in spirit in that museum which has the correct locality data and which is labelled " *Büttneria guttulata* ", a name that has never appeared in print ; this specimen undoubtedly belongs to the present species and is almost certainly the holotype.

The holotype of *Stenacropteryx eburneiguttata* Karsch was found to belong to *B. maculiceps* Karsch.

MATERIAL EXAMINED

Holotype. CONGO REPUBLIC : Kuako to Kimpoko, ♀ (*Büttner*) (Zool. Mus. Berlin—see above).

CAMEROUN : Lolodorf, 1 ♂ (*Conradt*) (Zool. Mus. Berlin) (Holotype of *Stenacropteryx eburneiguttata* Karsch) ; Mundame, 2 ♂, 3 ♀ (*Rhode*) (1 ♂ and 1 ♀ in British Museum (Nat. Hist.) ; remainder in Nat. Mus. Vienna) ; CONGO REPUBLIC : Eala, 1 ♂, 1–7.v.1935 (*Ghesquière*) (Mus. Af. Cent.) ; Eala, 1 ♀, viii.1936 (*Ghesquière*) (Mus. Af. Cent.).

DISTRIBUTION. As given for the genus.

LEIODONTOCERCUS Chopard, 1954

Leiodontocercus Chopard, 1954, La réserve naturelle intégrale du Mont Nimba. Fasc. II. Pt. III. Orthoptères Ensifères. *Mém. Inst. franç. Afr. noire* **40** (2) : 83. Type-species, by original designation, *Leiodontocercus angustipennis* Chopard, 1954.

DIAGNOSIS. ♂♀. Fastigium of vertex strongly compressed, sloping to frons, sulcate above. Fore wings narrow, obliquely truncate apically, as in Text-fig. 12. Male subgenital plate without styles.

DISCUSSION. This genus is a close relative of *Buettneria* Karsch, the much narrower fore wings providing the only important difference. It may be distinguished from *Phlaurocentrum* Karsch by the shape of the vertex and the lack of styles on the subgenital plate of the male.

Leiodontocercus Chopard was described from a single male collected from the Nimba Mountains in Guinea. The material available for this revision includes twelve further specimens of the genus, from Sierra Leone, Ghana, Nigeria, Cameroun and the Congo Republic. In all non-sexual features these specimens resemble each other very closely, both structurally and in coloration. Three of them are females, from Ghana, Nigeria and Cameroun ; they have a greatly reduced ovipositor of the type found in *Buettneria* Karsch and are taxonomically indistinguishable from each other. Most of the nine males, however, show wide divergences in the structure of the cerci, and have proved to be very difficult to segregate taxonomically. A male from Sierra Leone agrees well with the holotype of *L. angustipennis* Chopard. Three males from Ghana, while resembling each other closely in cercal structure, differ markedly in this respect from *L. angustipennis* Chopard, and I have used them (and the Ghanaian female) as the basis for *L. malleus* sp. n. One of the Congolese males again shows a very different cercal structure and forms the holotype of a third species, *L. condylus* sp. n. The remaining four males, one from Nigeria and three from the Congo Republic, though again all showing unique features in cercal structure, do not differ quite so markedly, and it would be unwise to base further new species on them (and the two female specimens associated with them) until more material is available. It is quite possible that many, perhaps all, of these differences are the result of geographical variation, and that it will later be found that *L. angustipennis* Chopard is a polytypic species distributed throughout West Africa.

DISTRIBUTION. The known range of this genus occupies most of Wallace's West African Sub-region.

KEY TO THE SPECIES OF *Leiodontocercus*

As mentioned above, the shape of the male cerci, which does not lend itself to verbal description, seems to provide the only character for separating the members of this genus. Although their identification is thus possible only by reference to Text-figs. 25–27, I have nevertheless thought it better to express this in the form of a dichotomous key than to give no key at all.

1. Cerci as in Text-fig. 25 . . . . **L. angustipennis** Chopard (p. 14)
–. Cerci as in Text-figs. 26 or 27 2
2. Cerci as in Text-fig. 26 . . . . **L. malleus** sp. n. (p. 14)
–. Cerci as in Text-fig. 27 . . . . **L. condylus** sp. n. (p. 15)

1. *Leiodontocercus angustipennis* Chopard, 1954

Leiodontocercus angustipennis Chopard, 1954, La réserve naturelle intégrale du Mont Nimba. Fasc. II. Pt. III. Orthoptères Ensifères. *Mém. Inst. franç. Afr. noire* 40 (2) : 84. Holotype ♂, GUINEA : Nimba (Mus. Hist. Nat. Paris).

DIAGNOSIS. ♂. Cerci as in Text-fig. 25.

♀ unknown.

MEASUREMENTS

	Males
Total length	(2) : 38·5–40·0, mean 39·25
Median length of pronotum	(2) : 3·2–3·5, mean 3·35
Length of hind femur	(2) : 21·1–21·6, mean 21·35
Length of fore wing	(2) : 25·8–27·1, mean 26·45

DISCUSSION. The shape of the male cerci enables this species to be distinguished from the two species described below.

MATERIAL EXAMINED

Holotype. GUINEA : Nimba, ♂, vii–xii.1951 (*Lamotte & Roy*) (Mus. Hist. Nat. Paris.).

SIERRA LEONE : Freetown, Mt. Aureol, 1 ♂, i.1956 (*Phipps*) (British Museum (Nat. Hist.)).

DISTRIBUTION. Known only from the Nimba Mountains and Sierra Leone.

2. *Leiodontocercus malleus* sp. n.

DIAGNOSIS. ♂. Cerci as in Text-fig. 26.

♀. No known diagnostic character.

DESCRIPTION. ♂. Fastigium of vertex strongly compressed, concave in profile, sulcate above. Pronotum without lateral carinae ; lateral lobes deeper than long. Fore tibiae with 4 external ventral spurs. Mid tibiae with about 6–7 external ventral spurs. Hind femora with about 5–9 external spines. Hind tibiae with about 20–22 external dorsal spines. Venation of fore wings similar to Text-fig. 12.

Tenth abdominal tergite enlarged, emarginate posteriorly. Cerci as in Text-fig. 26.

General coloration green. Head with black mark behind each eye, adjoining two corresponding black marks on pronotum ; hind margin of pronotal disc with black markings. Antennae brown with black and whitish bands ; basal two segments green. Tympana marked with black. Hind femora with two brown bands near apex ; hind tibiae with two whitish bands near base, alternating with brown bands. Tarsi with brown and whitish markings. Tibial spurs darkened ; femoral and tibial spines darkened towards tip. Area R_1 and parts of area R_s of fore wings mottled with brown. Stridulatory organ with black, brown and whitish markings. Exposed part of hind wings brown with green markings. Tip of abdomen brown.

♀. As male except for genitalia and fore wings. Ovipositior similar to Text-fig. 4.

MEASUREMENTS

	Males	Female
Total length	(3) : 35·3–38·9, mean 37·30	40·4
Median length of pronotum	(3) : 3·2–3·4, mean 3·32	3·5
Length of hind femur	(3) : 19·1–21·8, mean 20·80	22·0
Length of fore wing	(3) : 23·4–26·4, mean 25·10	27·6

VARIATION. The tibial spurs and spines and the femoral spines vary slightly in number.

DISCUSSION. Males of this species may be readily recognized by the shape of the cerci. The female specimen from Ghana has been ascribed to the present species on geographical grounds ; this sex is not likely to have any diagnostic characters.

MATERIAL EXAMINED

Holotype. GHANA : Western Region, nr. Wiawso, 3 miles N.W. of Tano Lodge, ♂, 14.x.1960 (*Jago*).

Paratypes. GHANA : Tafo, at light, 1 ♂, 19.iv.1957 (*Eastop*) ; Tafo, at light, 1 ♂, 20.iv.1957 (*Eastop*) ; Ashanti, Kumasi College of Technology, 1 ♀, 23.x.1960 (*Jago*).

All in the British Museum (Natural History).

DISTRIBUTION. Known only from Ghana.

3. *Leiodontocercus condylus* sp. n.

DIAGNOSIS. ♂. Cerci as in Text-fig. 27.

♀ unknown.

DESCRIPTION. ♂. Fastigium of vertex strongly compressed, concave in profile, sulcate above. Pronotum without lateral carinae ; lateral lobes deeper than long. Fore and mid legs missing from holotype except for left fore femur. Hind femora with about 7 ventral spines. Hind tibiae with about 21 external dorsal spines. Venation of fore wings similar to Text-fig. 12.

Tenth abdominal tergite enlarged, emarginate posteriorly. Cerci as in Text-fig. 27.

Coloration as in *L. malleus* sp. n. (p. 14).

♀ unknown.

MEASUREMENTS

	Male
Total length	36·3
Median length of pronotum	3·4
Length of hind femur	20·1
Length of fore wing	24·9

DISCUSSION. This species may be recognized by the shape of the male cerci.

MATERIAL EXAMINED

Holotype. CONGO REPUBLIC : Kibali-Ituri, Yindi, ♂, v.1949 (*Bertrand*) (Mus. Af. Cent.).

MYLLOCENTRUM gen. n.

Type-species : *Phlaurocentrum stigmosum* Karsch, 1896.

DIAGNOSIS. ♀. Fastigium of vertex moderately compressed, sloping steeply to frons, sulcate above, as in Text-fig. 2. Fore wings of moderate breadth, shaped as in Text-fig. 13. Tenth abdominal tergite unmodified. Ovipositior very much reduced, shaped as in Text-fig. 5.

♂ unknown.

DESCRIPTION. ♀. Fastigium of vertex moderately compressed, sloping steeply to frons, sulcate above, as in Text-fig. 2.

Pronotum punctulate, without lateral carinae, though with slight tendency towards their formation. Fore coxal spine present, but not very well-developed. Internal tympanum of fore tibiae conchate, external tympanum open. Fore wings of moderate breadth, shaped as in Text-fig. 13.

Tenth abdominal tergite unmodified. Ovipositor very much reduced, shaped as in Text-fig. 5.

♂ unknown.

DISCUSSION. This genus is not a very close relative of the other three genera covered by this revision, though sharing with them the greatly reduced ovipositor. The fastigium of the vertex is very much less compressed than is the case in these genera, the legs are relatively shorter, and the facies is broader and more robust ; in addition, the fore wings are hardly truncate at the apex and the female tenth abdominal tergite is unmodified. In these respects *Myllocentrum* gen. n. approaches *Enochletica* Karsch, in which, however, the vertex is not at all compressed, the legs are relatively even shorter, and the ovipositor, though small, is of normal shape and crenulate at the tip.

DISTRIBUTION. Known only from Nigeria and Cameroun.

Myllocentrum stigmosum (Karsch, 1896)

Phlaurocentrum stigmosum Karsch, 1896, *Stettin ent. Ztg* **57** : 336. Holotype ♀, CAMEROUN : Lolodorf (Zool. Mus. Berlin).

DIAGNOSIS. ♀. Fore wings as in Text-fig. 13. Ovipositor as in Text-fig. 5.

♂ unknown.

MEASUREMENTS

		Females
Total length	(1) :	53·8
Median length of pronotum	(2) :	5·1–5·2, mean 5·15
Length of hind femur	(1) :	18·2
Length of fore wing	(2) :	41·1–41·3, mean 41·20

DISCUSSION. The black spots on the fore wings of this species are quite distinctive (see Text-fig. 32) ; there are also black markings on the vertex, the sides of the pronotal disc, and along the dorsal surface of the hind tibiae.

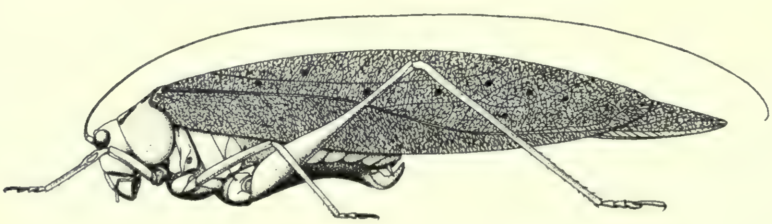


FIG. 32. *Myllocentrum stigmosum* (Karsch), female.

The small teeth (probably stridulatory in function) on certain veinlets in the anal area of the right female fore wing, which are shown by many Phaneropterinae, are particularly conspicuous in this species; the veinlets concerned are unusually prominent and are shown in Text-fig. 13.

MATERIAL EXAMINED

Holotype. CAMEROUN: Lolodorf, ♀ (*Conradt*) (Zool. Mus. Berlin).

NIGERIA: Oban distr., 1 ♀ (*Talbot*) (British Museum (Nat. Hist.)).

DISTRIBUTION. As given for the genus.

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NEW DIASPIDIDAE (HOMOPTERA : COCCOIDEA) FROM THE INDO-MALAYAN REGION

W. J. HALL

AND

D. J. WILLIAMS

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BY

W. J. HALL and D. J. WILLIAMS xvf

Commonwealth Institute of Entomology, London

Pp. 19–43 ; 13 *Text-figures*

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NEW DIASPIDIDAE (HOMOPTERA : COCCOIDEA) FROM THE INDO-MALAYAN REGION

By W. J. HALL AND D. J. WILLIAMS

SYNOPSIS

Of the 13 new species described below, 3 belong to the Diaspidini, 5 to the Parlatoriini and 5 to the Aspidiotini.

Examination of a mass of unidentified Coccid material from the Indo-Malayan region in the collections of the British Museum (Natural History) has revealed the presence of a few species apparently new to science. A collection from Pakistan recently sent by Dr. M. A. Ghani to the Commonwealth Institute of Entomology for determination also contained 6 species new to science. Dr. Ghani is to be congratulated on discovering these particularly interesting new forms.

The lettering used in the figures is as follows :—A. Adult female, general aspect. B. Pygidium. C. Dorsal margin of pygidium. D. Pygidium of second stage female.

The holotypes and paratypes are deposited in the British Museum (Natural History).

***Aulacaspis discorum* sp. n.**

(Text-fig. 1)

Scales of the adult female dull white, subcircular or broadly pyriform, convex ; exuviae brown, coated with a film of secretionary matter ; situated marginally. Diameter about 1·5 mm.

Male scales not seen.

Length of body of adult female when mounted about 1·2 mm., width 0·9 mm. Widest across the prosoma which is only slightly wider than the metathorax. Prosomal tubercles lacking. Anterior spiracles with a compact crescent-shaped group of about 30 pores ; posterior spiracles with about half this number. Median lobes strongly divergent with their bases in close apposition and joined by a sclerotized yoke ; rounded apically with inner margins very faintly serrated. Second lobes well developed, third lobes present but more squat, fourth lobes, if present, only poorly developed. With pairs of gland spines in the first and second interlobular spaces, in each pair the outer being much the longer spine of the two ; a single spine between the third and fourth lobes, another beyond the fourth and with a group of 5 at the base of the pygidium, and 7 to 9 laterally on the second and third abdominal segments. Three submarginal rows of dorsal ducts, each containing 7 or 8 ducts on segments 3, 4 and 5, and 4 rows of submedian ducts on segments 3 to 6, the innermost row on segment 6 with usually 3 ducts, the other rows with 4 or 5. Segments 1, 4, 5 and 6 each with a well marked submarginal boss. Small groups of short microducts submarginally on the ventral surface of pygidium. Perivulvar pores in 5 groups ; median 7–12 ; anterior laterals 20–27 ; posterior laterals 15–20. Anal orifice near the centre of pygidium.

Holotype. ♀. PAKISTAN : Chharrapani, on roots of *Panicum psilopodium* (Gramineae), 29.i.1961 (Comm. Inst. Biol. Control, Rawalpindi, No. 204).

Paratypes. PAKISTAN : 10 ♀, same data as holotype.

Aulacaspis discorum seems to come closest to *A. rosae* (Bouché) from which it differs in the median lobes being in apposition at their bases ; in having pairs of gland

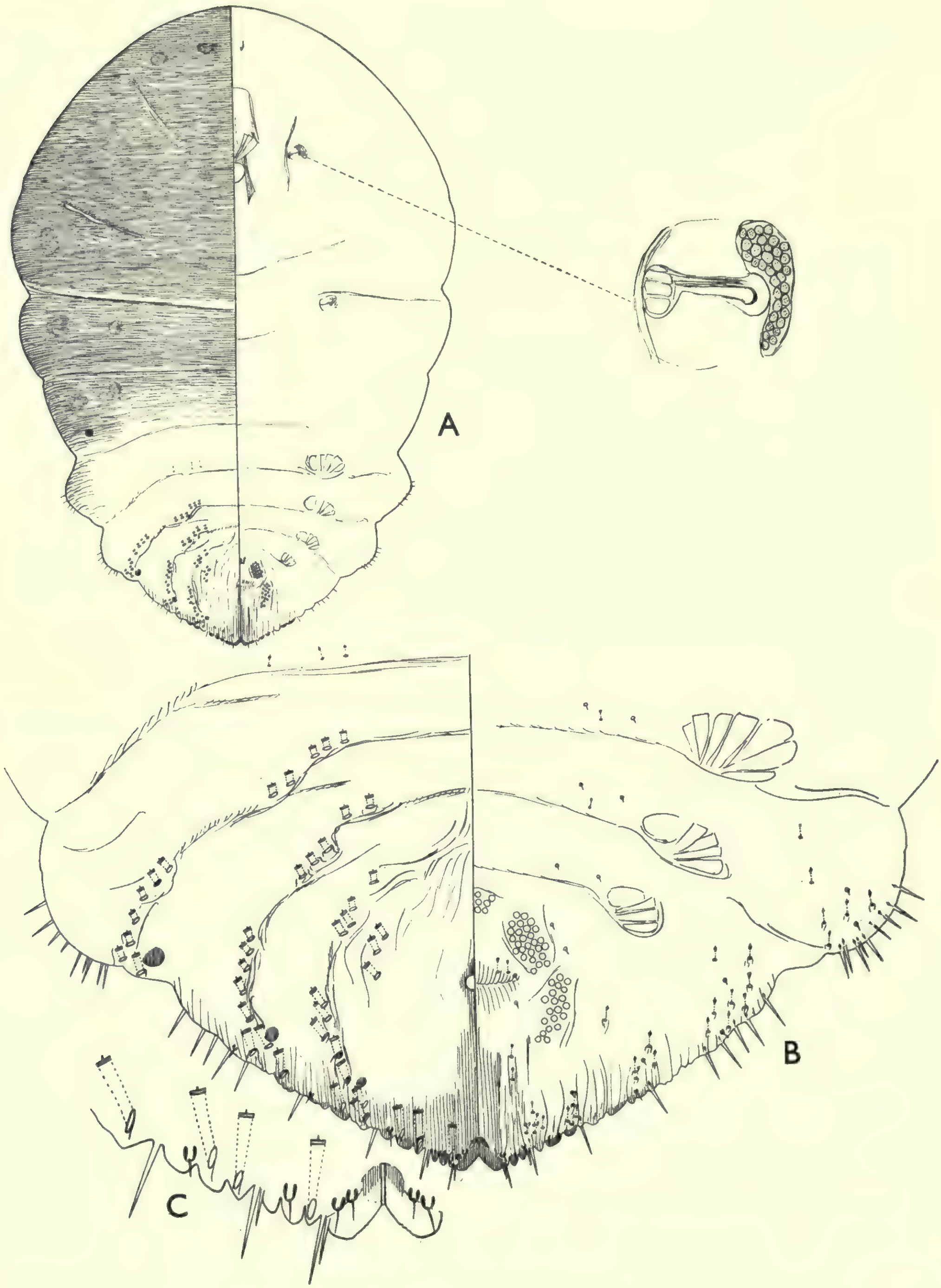

FIG. 1. *Aulacaspis discorum* sp. n.

spines in the first and second interlobular spaces, the outer spine of the pair being much longer than the inner, and in the well marked submarginal bosses on segments 1, 4, 5 and 6. Not one of these features is found commonly amongst the species of this genus.

It seems strange that this species should be found on the roots as all others in the genus are aerial.

Fiorinia hederae **sp. n.**

(Text-fig. 2)

Scale of female of the type normal for the genus consisting of the yellow or pale brown enlarged second exuviae overlaid by a white secretionary film that extends beyond the exuviae to give a narrow fringe laterally and posteriorly. First exuviae terminal, dark brown, with the covering secretionary film worn off in some specimens.

Scale of male not seen.

Adult female, when mounted, membranous, of normal form about 1·1 mm. wide. Antennal tubercles each with a single curved seta and with a prominent membranous process between them. Anterior spiracles with about 5 trilocular pores. Pygidium with all but the basal area slightly sclerotized ; median lobes only present, these small of irregular rather jagged outline and set apart by a distance slightly less than the width of one, connected by a narrow sclerotized arc. Pygidium with 4 marginal macroducts on either side and a few microducts submarginally on both dorsal and ventral aspects. Perivulvar pores in 5 groups, average of 7 examples, median group 6 (5–7), anterior laterals 13 (12–16) and posterior laterals 16 (11–22). Anal aperture situated towards the base of pygidium. Free abdominal and metathoracic segments each with 2–5 marginal gland spines with swollen bases.

Median lobes of second stage female retracted into the apex of pygidium, strongly divergent, bases yoked and inner edges serrated. Second lobes well developed, bilobed. Pygidium with 5 macroducts marginally on each side. Three gland spines set on conspicuous tubercles marginally on the free abdominal segments.

Holotype. ♀. PAKISTAN : Murree, on leaves of *Hedera helix* (Araliaceae), 24.ii. 1961 (Comm. Inst. Biol. Control, Rawalpindi, No. 185).

Paratypes. PAKISTAN : 6 ♀, same data as holotype.

F. hederae is a typical *Fiorinia* bearing a distinct resemblance to *F. kandyensis* Green. It resembles that species in having a well developed interantennal process, in having trilocular parastigmatic pores (*F. chinensis* Ferris has a similar type of pore but it is not generally true of other species in which these pores are represented), and in the number and nature of the pygidial ducts in both the adult and second stage females. The adult of *F. kandyensis*, however, has very much longer setae on the margin of the pygidium than those found in *F. hederae*, and a shorter interantennal prominence, as well as other small differences.

Mitulaspis malayana **sp. n.**

(Text-fig. 3)

Scale of adult female low convex, very broadly pyriform, almost circular, and opaque white but usually appearing dark brown owing to incorporated matter. Exuviae set marginally, golden yellow, masked by a thin film of white secretionary matter. In some examples the scale shows indications of fluting. Width about 1·5 mm.

Male scale white, rounded at either end, slightly wider about the middle, uncarinated.

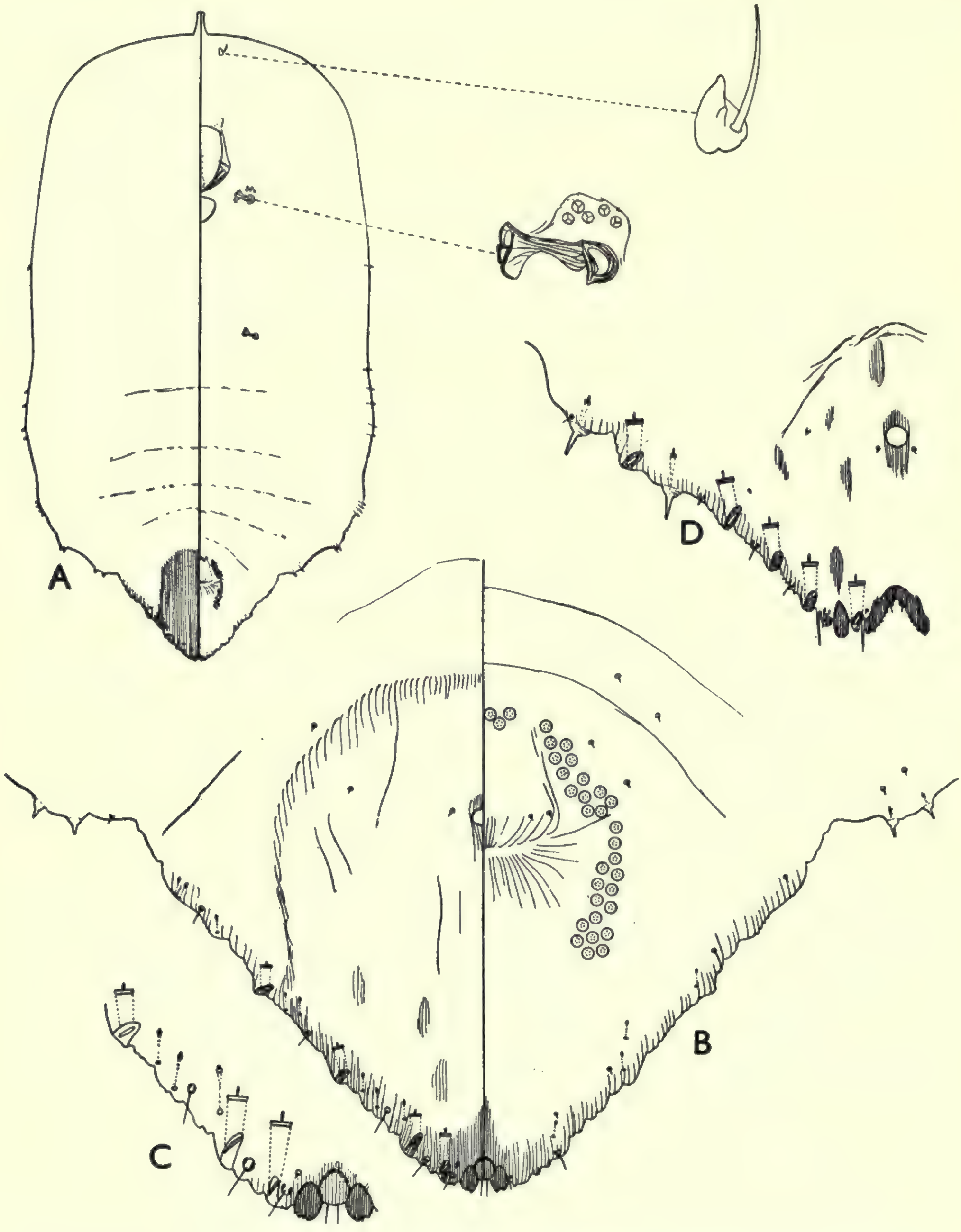

FIG. 2. *Fiorinia hederae* sp. n.

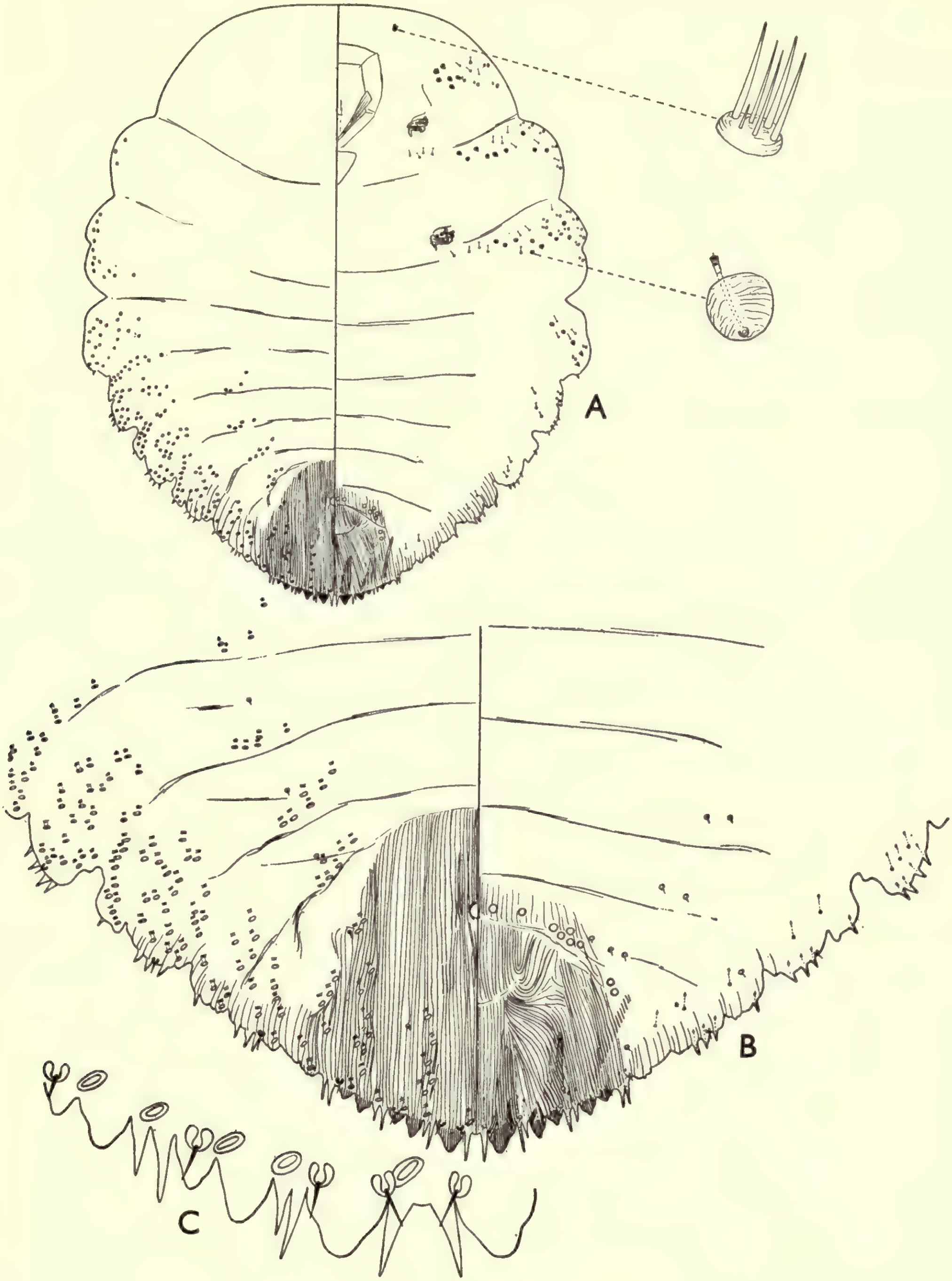

FIG. 3. *Mitulaspis malayana* sp. n.

Body of adult female about 1·0 mm. wide, broadly ovate, membranous with clearly demarked thoracic and abdominal segmentation. Antennae with about 6 subequal stout setae. Anterior spiracles with 8–10 pores, posterior pair with 4–9. Pygidium with a well defined sclerotized central area. Median lobes obconical, rounded apically, set apart by a space about the width of one. Within this space is a macroduct associated with inner angle of one or other of the median lobes. Second and third lobes of similar form, duplex but smaller, with the outer lobule smaller than the inner. Gland spines stout, bluntly pointed, in pairs in the interlobular spaces and just beyond the third lobes A group of 3 gland spines at the base of pygidium and 3 or 4 marginally on each abdominal segment. Perivulvar pores arranged in a semicircle, groups not well defined but each posterior group containing usually 2 ; anterior groups with about 5 in each group linked by 1 to 3 single pores Well defined rows of dorsal ducts running in from the margin on the sixth and seventh segments. Anterior to the seventh segment the pores are separated into submedian and marginal groups, the submedian groups extending as far as abdominal segment 2. Ducts in the marginal and submarginal areas of all segments as far as the mesothorax numerous and scattered. Gland tubercles numbering 3–10 submarginally on the thoracic segments and first free abdominal segment. Anal orifice situated towards base of pygidium.

Holotype. ♀. MALAYA : Kuala Lumpur, on stems of *Cinnamomum camphora* (Lauraceae), 4.v.1927 (*G. H. Corbett*) (Dept. Agric., Kuala Lumpur, No. 3815).

Paratypes. MALAYA : 1 ♀, same data as holotype. MALAYA : Kuala Lumpur, *Cinnamomum zeylanicum*, 14 ♀, 8.vii.1929 (Dept. Agric. Kuala Lumpur, No. 3964).

Hall (1946) pointed out that this species was not only congeneric with but extremely close to *Mitulaspis funtumiae* (Newstead) described from Uganda on *Funtumia latifolia* (Apocynaceae). It is, however, a much smaller species of quite different shape and unlike *M. funtumiae* it possesses perivulvar pores and gland tubercles on the thoracic segments. In other respects the two species bear a striking resemblance to each other. It is surprising that the only two known species of this genus should have been found in such widely separated areas. One suspects that other species remain to be discovered but whether in South East Asia or in Africa or both is a matter for conjecture.

Cryptoparlatoreopsis euphorbiae sp. n.

(Text-fig. 4)

Second stage exuviae subcircular, reddish brown, within which the outline of the adult female can be seen. Exuviae coated with a thin film of white secretionary matter. Diameter about 1·0 mm.

Male scale not seen.

Adult female broadly rounded in front, abdominal segments abruptly narrowed, terminating in a somewhat acute pygidium. Antennal tubercle with a single stout curved seta. Spiracles without pores. Margin of meso- and metathorax lined with gland tubercles interspersed with a few microducts. Pygidium acute with 2 pairs of lobes, median pair set close together but not yoked, rounded apically and falling away laterally, with serrated margin; second lobes of similar form but smaller. Pygidium with 2 macroducts on either side, one in the first interlobal space and the other in the second space if a third lobe were represented. There are 8 long setae on either side, 4 on the dorsal aspect of the margin and 4 on the ventral. Also in the first interlobal space an apically truncated duct-carrying projection with 4 more at intervals between the second lobe and base of the pygidium and 2 or 3 marginally on each free abdominal segment. Both dorsal and ventral aspects of pygidium with a very few scattered microducts. Perivulvar pores wanting. Anal orifice small, set near the centre of pygidium.

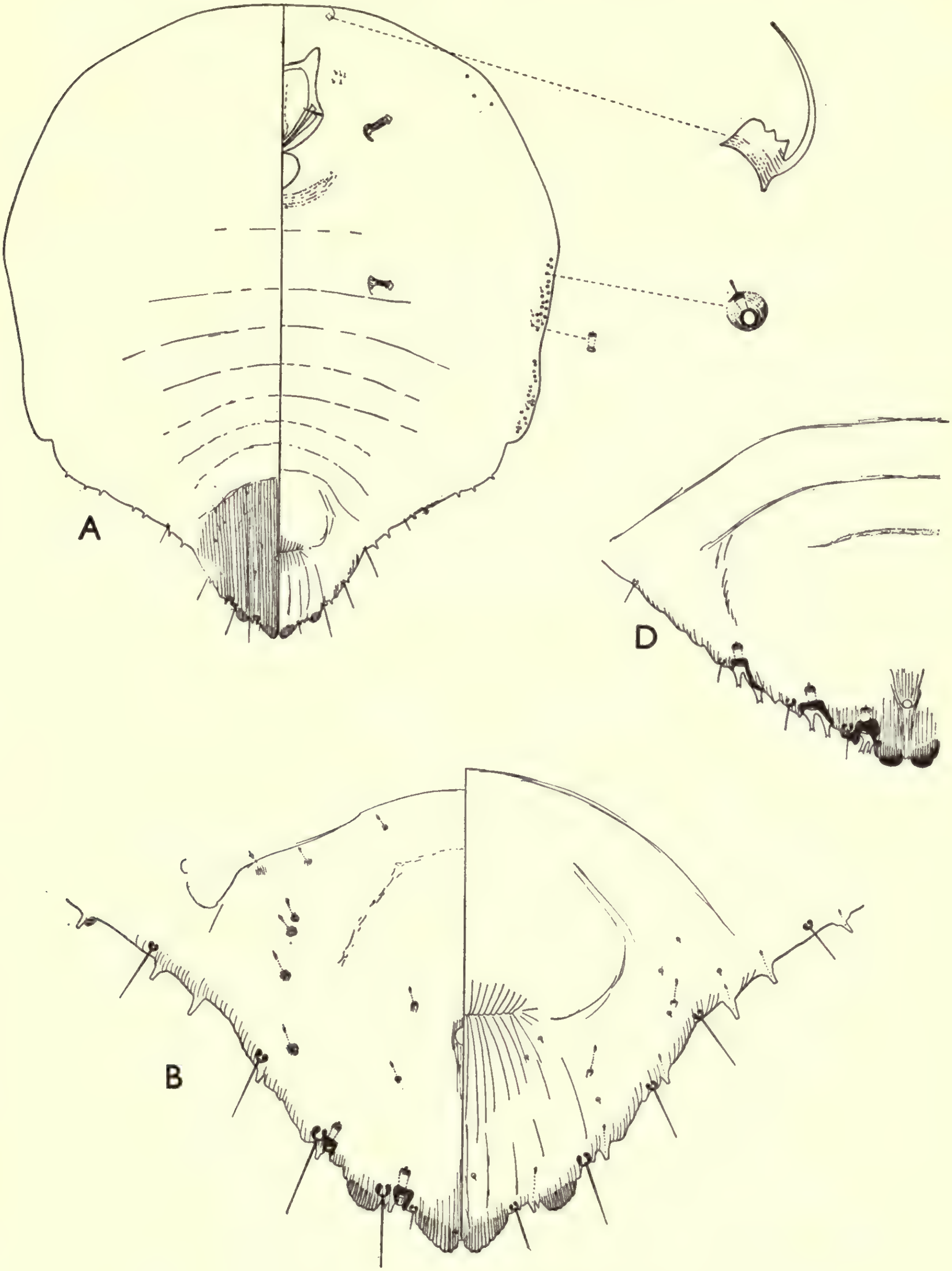

FIG. 4. *Cryptoparlatoreopsis euphorbiae* sp. n.

Pygidium of second stage female with median lobes broad and flatly rounded, with a notch on the outer edge and set apart by about a third of the width of one; second lobes present but poorly developed. With a macroduct in the first interlobal space and 2 more beyond second lobes. Each macroduct associated with a pair of apically truncated gland spines.

Holotype. ♀. INDIA: Marudamalai Hills, Coimbatore, on the flattened stems of *Euphorbia antiquorum* (Euphorbiaceae), 3.x.1951 (*T. S. Muthukrishnan*) (Agric. College, Coimbatore, No. 29), in association with *Gymnaspis cassida* sp. n.

Paratypes. INDIA: 12 ♀, same data as holotype.

This species seems to have a very definite affinity with *C. halli* (Bodenheimer), the type of the genus *Cryptoparlatoreopsis* Borchsenius. Balachowsky correctly assigned his *Aonidia tlaiae* to this genus and transferred *Targionia meccae* Hall. He considered that *Cryptoparlatoreopsis* belonged to the subtribe Aonidina although, as he pointed out, it has characters approaching the genus *Parlagena* of the tribe Parlatoriini, but that it differed from that genus in the total absence of gland tubercles on the cephalothorax. It should be pointed out, however, that *P. inops* McKenzie, the type of *Parlagena*, appears to be without such tubercles. The genus *Cryptoparlatoreopsis* may well be a connecting link between the subtribe Aonidina of the tribe Aspidiotini and the Parlatoriini, but the presence of gland tubercles on the thorax and duct-carrying plates or projections marginally, the nature of the marginal macroducts in the adult and second stage females all suggest affinity to the Parlatoriini rather than the Aonidina. The ducts seem to be 2-barred although their structure is obscure and not easy to determine.

Gymnaspis cassida sp. n.

(Text-fig. 5)

Female scale pupillarial, highly convex, anterior portion broadly rounded, posterior half narrowed and flattened apically. Colour black giving way to a deep reddish brown towards the posterior extremity. Length about 1·0 mm., width the same.

Male scale white, subcircular, with conspicuous and rather large black exuviae, sometimes masked by a little white secretionary matter.

Adult female when mounted, membranous, widest across the mesothorax, anterior to this flatly rounded, posteriorly abruptly narrowed towards pygidium which is flattened apically. Antennal tubercles carrying a single stout curved seta. A prominent thoracic tubercle present on each side. Pygidium with 4 pairs of lobes all of which are short but very wide and flatly rounded, the median pair being set apart by only a little more than half the width of one. Two short apically fimbriate plates between the median lobes and in the first and second interlobular spaces; in no case do these extend beyond the lobes. Submarginally on the first and third interlobular spaces are 2, 3 and 1 tubular ducts respectively. Anal orifice nearer apex than base of pygidium. Perivulvar pores wanting. Ventral dermis with a few microducts scattered submarginally over basal half of pygidium.

Second stage female heavily sclerotized with a pygidium of the form typical of the Parlatoriini; with 6 pairs of tusk-like lobes. Between the median lobes and in the first two interlobal spaces there are 2 apically fimbriate plates; in the other 3 spaces there are 3 similar plates. With 5 tubular macroducts on either side, 1 in each lobal space except between the median lobes. Anal orifice rather obscure in some specimens, set in from apex of pygidium by a distance about equal to the length of the median lobes.

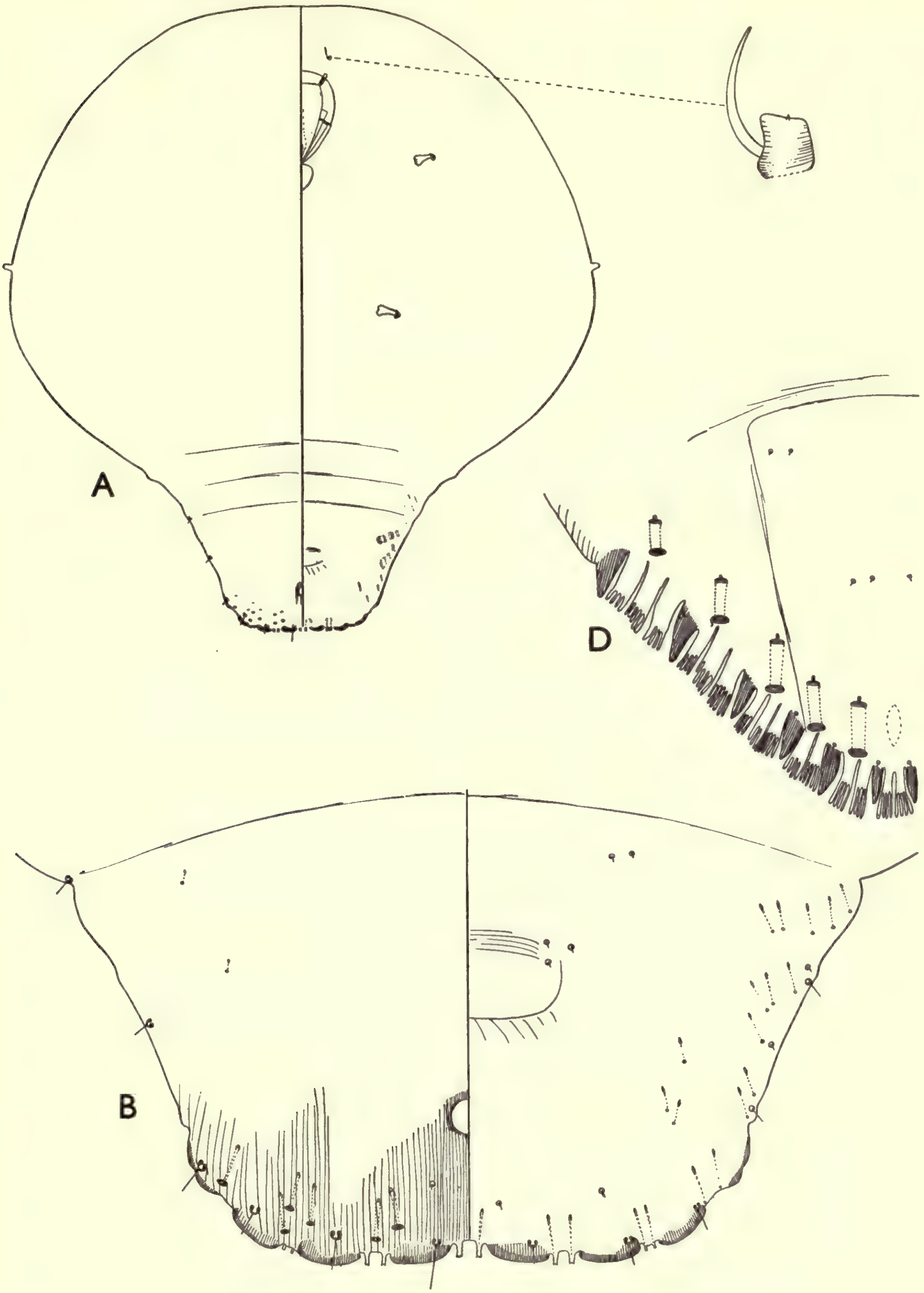

FIG. 5. *Gymnaspis cassida* sp. n.

Holotype. ♀. INDIA : Marudamalai Hills, Coimbatore, on the flattened stems of *Euphorbia antiquorum* (Euphorbiaceae), 3.x.1953 (*T. S. Muthukrishnan*) (Agric. College, Coimbatore, No. 29) in association with *Cryptoparlatoreopsis euphorbiae.*

Paratypes. INDIA : 21 ♀, same data as holotype.

This species bears a close resemblance to *Gymnaspis bullata* (Green). The pygidial lobes, however, in the adult female are wider and the median lobes are much further apart in *G. cassida* than *G. bullata*. Green also makes no mention of thoracic tubercles in *G. bullata* nor are they apparent in the type and other preparations available. The second stages differ in that *G. bullata* has two additional macroducts submarginally, duplicating the first and second ducts on each side. The differences referred to above, though small, are consistent and one cannot very well assign the present material to *G. bullata*, close as it obviously is. It may be that when more material comes to hand intermediate forms may be found that will bridge the present gap between *G. cassida* and *G. bullata*. Attention is drawn to the fact that *G. bullata* does not appear to be congeneric with *G. aechmeae* Newstead, the type of *Gymnaspis*, but for the time being *G. bullata* and *G. cassida* are left in that genus until such time as the genus *Gymnaspis* and close generic allies are better known.

Leucaspis coniferarum sp. n.

(Text-fig. 6)

Scale of female elongate and slender consisting of the pale brown sclerotized second exuviae overlaid by a rather thick white secretionary film that masks the colour and often the darker brown colour of the terminally placed first exuviae. Length of second exuviae about 1·8 mm.

Male scale not observed.

Adult female when mounted, elongate oval, about 0·7 mm. long, membranous. Antennal tubercles carrying 4 setae of varying length and stoutness. Anterior spiracles with usually 2 pores. Pygidium broadly rounded with 3 pairs of lobes, median pair triangular, set widely apart, second pair squat, rounded at apex and notched on outer edge, third pair poorly developed, squat and broadly rounded. Pygidium without either plates or gland spines but with 5 or 6 microducts on the dorsal aspect submarginally. Anal orifice rather nearer base than apex of pygidium. Perivulvar pores wanting.

Second stage female with broadly rounded pygidium carrying 3 pairs of lobes, median pair tusk-like, apically rounded, second pair similar and very little smaller, third pair shorter but wider. Plates between the lobes and beyond the third pair apically fimbriate. With a macroduct between median lobes and 7 macroducts marginally on each side ; all macroducts set with their axes parallel to the margin. Dorsal aspect with a few ducts of smaller size scattered over the submarginal and submedian areas.

Holotype. ♀. PAKISTAN : Cherat, North West Frontier Province, lying along the needles of *Pinus longifolia* (Pinaceae), 30.iv.1916. (*T. B. Fletcher*).

Paratypes. PAKISTAN : 5 ♀, same data as holotype. PAKISTAN : Murree, *Pinus excelsa*, 4 ♀, 13.v.1960 (Comm. Inst. Biol. Control, Rawalpindi, No. 199).

Leucaspis coniferarum comes closest to *L. loewi* Colvée from which the adult female differs in lacking perivulvar pores, in having larger pygidial lobes of a different shape and much closer together, and in having fewer dorsal ducts on the pygidium.

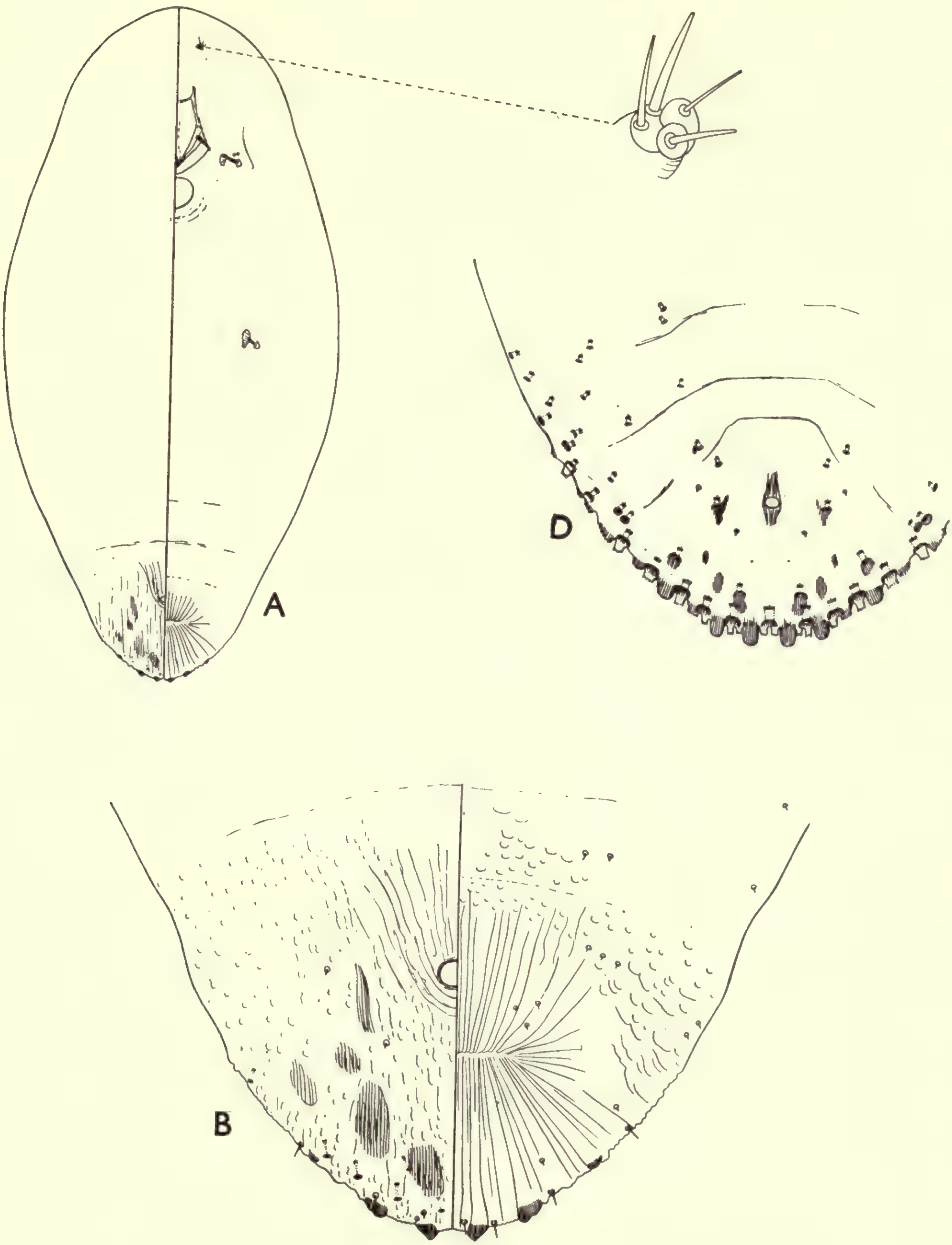

FIG. 6. *Leucaspis coniferarum* sp. n.

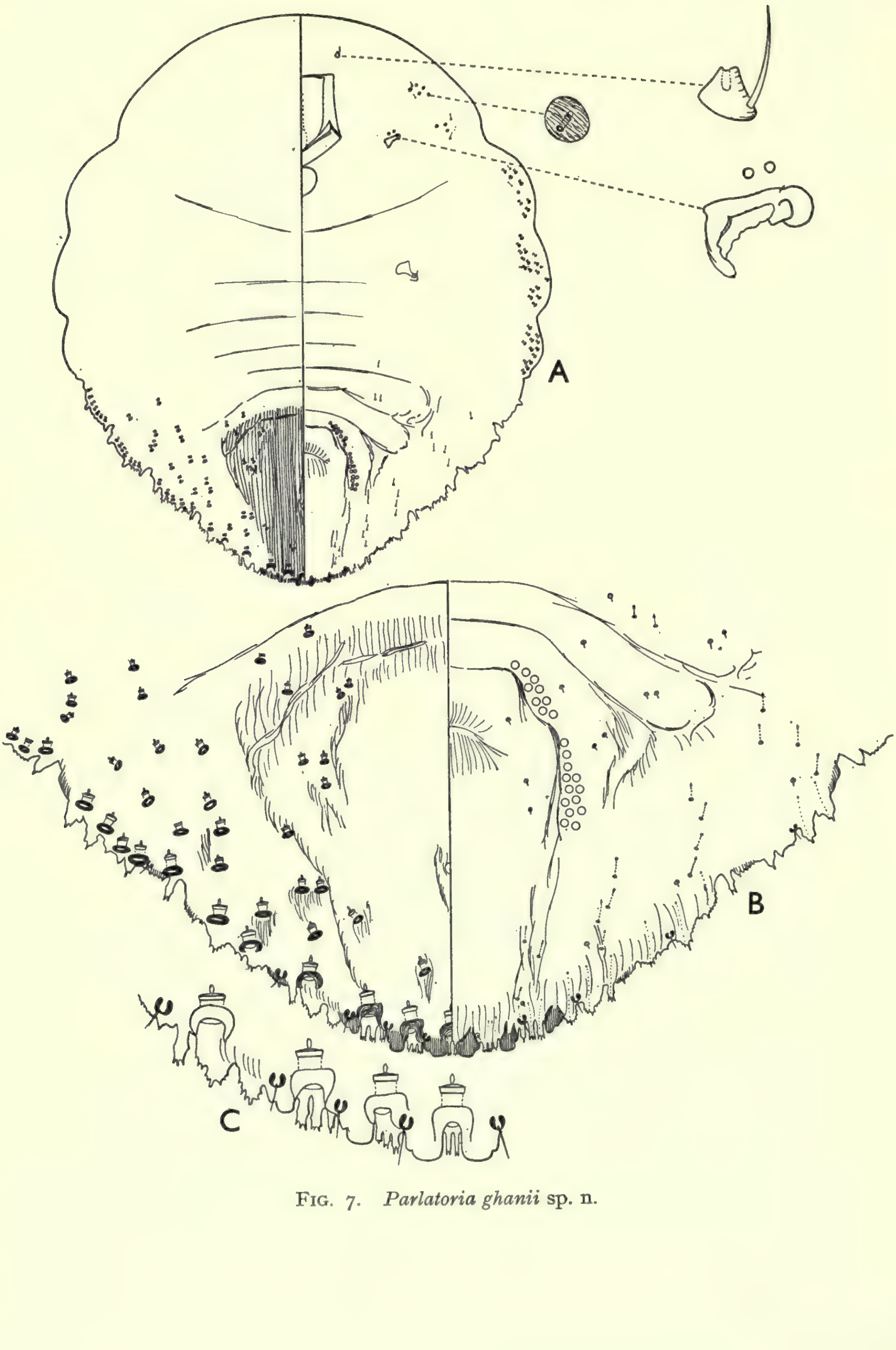

FIG. 7. *Parlatoria ghanii* sp. n.

Parlatoria ghanii **sp. n.**

(Text-fig. 7)

Only spirit material available. Female scale appearing white, broadly ovate with large pale brown exuviae, covered with a film of white secretionary matter. Approximate length 1·1 mm., width 0·9 mm.

Male scale similar to that of the female but smaller and elongate.

Adult female on the slide broadly ovate, about 0·75 mm. long and 0·65 mm. wide. Anterior spiracle with 1–5 pores. Pygidium with 3 pairs of well developed flatly rounded lobes, median pair set close to each other with a macroduct between and once notched on their outer margins, second and third lobes of similar shape but successively smaller. Fourth lobes represented by small sclerotized spurs. Interlobular plates narrow, parallel sided and apically fimbriated; between the third and rudimentary fourth lobes 3 plates, 1 similar to the interlobular plates, the other 2 broad at the base, tapering, with distal half fimbriate. Beyond the rudimentary fourth lobes the plates are of the broad basal type. Anal orifice rather nearer to apex than base of pygidium; vulva towards base. Perivulvar pores in 4 groups: average of 5 examples, anterior pair, 11 (9–13); posterior pair, 12 (10–15). Dorsal submarginal macroducts on the pygidium fairly numerous, scattered, about 20 in number, extending as far as the second free abdominal segment. Three intermediate dorsal macroducts on segment 4 and with 5 on segment 5. Three small groups of ventral gland tubercles each with 2–5 tubercles, 1 on the mesothorax and the other 2 anterior to this. No trace of a derm pocket. Ventral surface of pygidium with only a few microducts. Three groups of tubular ducts laterally on the first free abdominal segment and the two segments anterior to it.

Holotype. ♀. PAKISTAN: Rawalpindi, on the branches and stipules of *Acacia modesta* (Leguminosae), 9.i.1961 (Comm. Inst. Biol. Control, Rawalpindi, No. 193).

Paratypes. PAKISTAN: 5 ♀, same data as holotype.

P. ghanii comes close to *P. fluggeae* Hall and *P. pittospori* Maskell. From *P. fluggeae* it differs in the shape of the pygidial lobes, the very much fewer pores associated with the anterior spiracles and in lacking the rows of intermediate dorsal macroducts on the third and fourth abdominal segments. From *P. pittospori* it differs in the shape of the pygidial lobes, the nature of the plates anterior to the third lobes and the comparative absence of tubular ducts on the first abdominal and second thoracic segments.

Parlatoria serrula **sp. n.**

(Text-fig. 8)

Characters of the scale not known.

Adult female when mounted broader than long, about 0·7 mm. broad by 0·6 mm. long. Anterior spiracles with 1–3 pores. Thoracic gland tubercles usually 3 only, between the anterior spiracles and margin. In the same vicinity but on the dorsal surface is an 8-shaped cicatrix-like structure one part of which is larger than the other. Pygidium broadly rounded with 3 pairs of lobes; median lobes broad at base, parallel sided over the basal half, with a small, triangular, apically rounded terminal half; second lobes of similar deeply notched form and very little smaller; third lobes smaller without a notch on inner edge but with 2 or 3 on outer margin. Plates broad and apically fimbriate; beyond the third lobes they are of finger-shape gland spine form. A single marginal macroduct between median lobes and 6 marginally on each side; all macroducts set at an angle of 45° to the margin. Submarginal macroducts on the pygidium usually limited to 2; ducts on the prepygidial segments few in number, smaller and confined to the margin. Perivulvar pores in 4 groups, anterior pair 7 in each, posterior pair 3. Anal orifice near centre of pygidium. The free abdominal segments each with a distinct submarginal boss dorsally on each side.

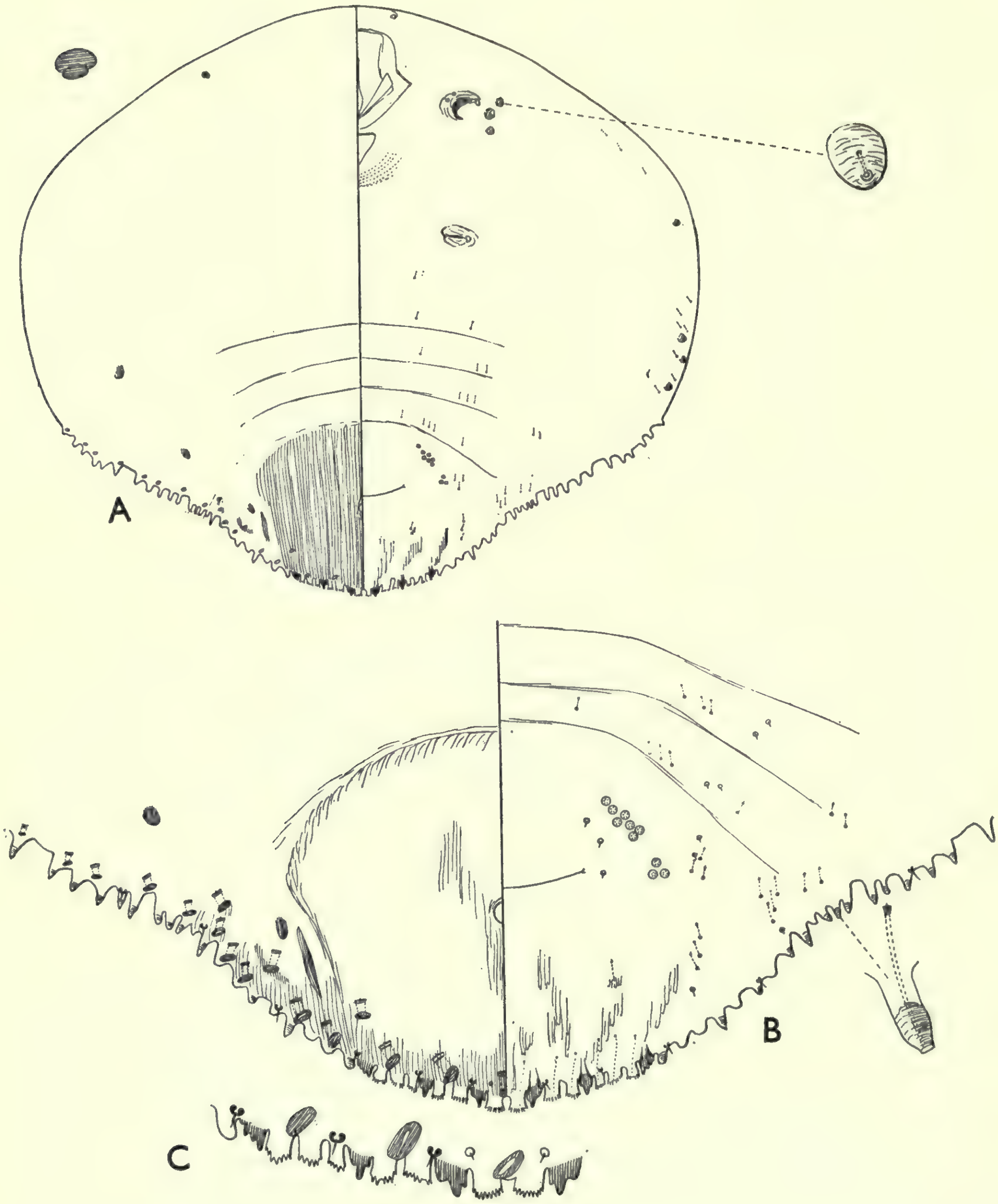

FIG. 8. *Parlatoria serrula* sp. n.

Holotype. ♀. CEYLON : Peradeniya, on *Cocos* sp. (Palmae), 6.ix.1956 (*B. Manickavasagar*).

Paratypes. CEYLON : 2 ♀, same data as holotype.

Three specimens of *P. serrula* were found on some coconut material heavily infested with *Pseudococcus citriculus* Green. It is clearly not a typical *Parlatoria* but it is thought advisable to assign it to this genus until more is known of other closely allied genera. In some respects it bears a slight resemblance to *P. aonidiformis* Green and *Parlaspis papillosa* (Green). It differs from both in the orientation of the pygidial marginal macroducts and the presence of bosses on the free abdominal segments. The pygidial lobes resemble those found in *Parlaspis papillosa* but this species has no cicatrix-like structure. In *Parlatoria aonidiformis* the pygidial lobes are of different form and although it has one or two cicatrix-like structures on either side these are on the second abdominal segment and not in the vicinity of the anterior spiracles.

Aonidiella abietina sp. n.

(Text-fig. 9)

Scale of the female circular, translucent, the body of the sublying female showing through ; exuviae subcentral, pale brown or reddish brown. Diameter about 1·5 mm.

Male scale not seen.

Adult female heavily sclerotized at maturity and strongly reniform. Pygidium retracted, with lobes, paraphyses and plates as in *A. citrina* (Coquillet). Prevulvar scleroses absent ; prevulvar apophyses present. Dorsal ducts in 3 rather irregular rows on the pygidium and in addition a group of 8–10 similar ducts submarginally on each free abdominal segment. Perivulvar pores wanting. Ventral dermis of free abdominal segments with submarginal groups of microducts.

Holotype. ♀. PAKISTAN : Murree, on the needles of *Abies pindrow* (Pinaceae), 1.xi.1961 (*M. A. Ghani*).

Paratypes. PAKISTAN : 9 ♀, same data as holotype ; 7.xi.1958, 5 ♀ (*M. A. Ghani*).

The specimen selected as holotype is a young adult female before sclerotization has set in.

This species is close to *A. aurantii* (Maskell) and *A. citrina* (Coquillet). It differs from both, however, in having groups of submarginal macroducts on the free abdominal segments and in having rather more ducts on the pygidium. It differs from *A. aurantii* further in lacking prevulvar scleroses and in the different shape of the prevulvar apophyses. It is also close to *A. messengeri* McKenzie described from the Ryukyu Islands and Taiwan but this species possesses prevulvar scleroses in addition to apophyses although they are variable and poorly developed ; it has fewer pygidial macroducts and lacks submarginal macroducts on the free abdominal segments but it has a thoracic tubercle on either side of the body which are lacking in *A. abietina*.

Aspidiotus selangorensis sp. n.

(Text-fig. 10)

Characteristics of the scales not known.

Body of adult female membranous, broadly ovate, about 0·9 mm. wide. Antennal tubercle with a single curved seta. Each spiracle surrounded by a well defined faintly sclerotized area.

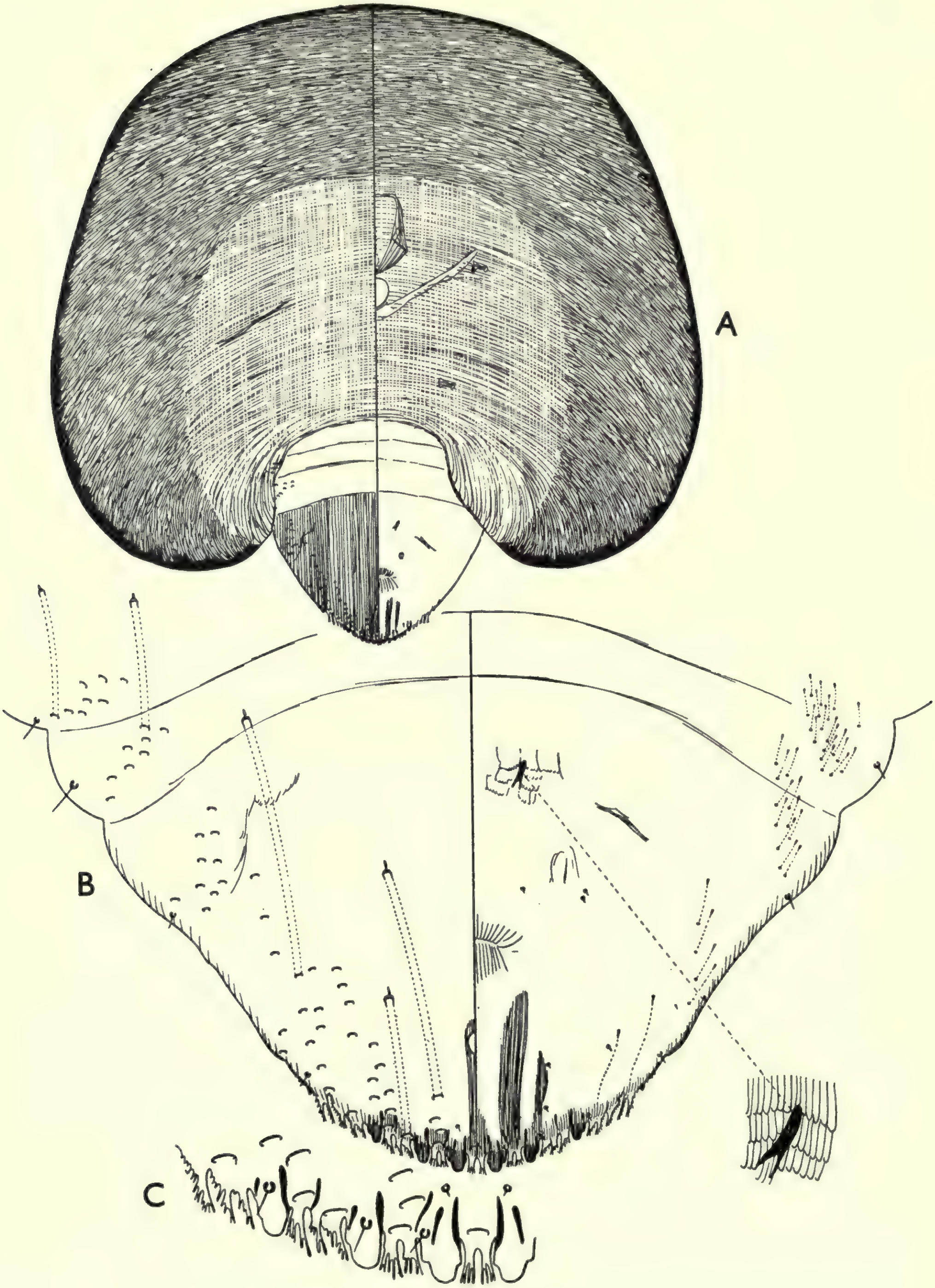

FIG. 9. *Aonidiella abietina* sp. n.

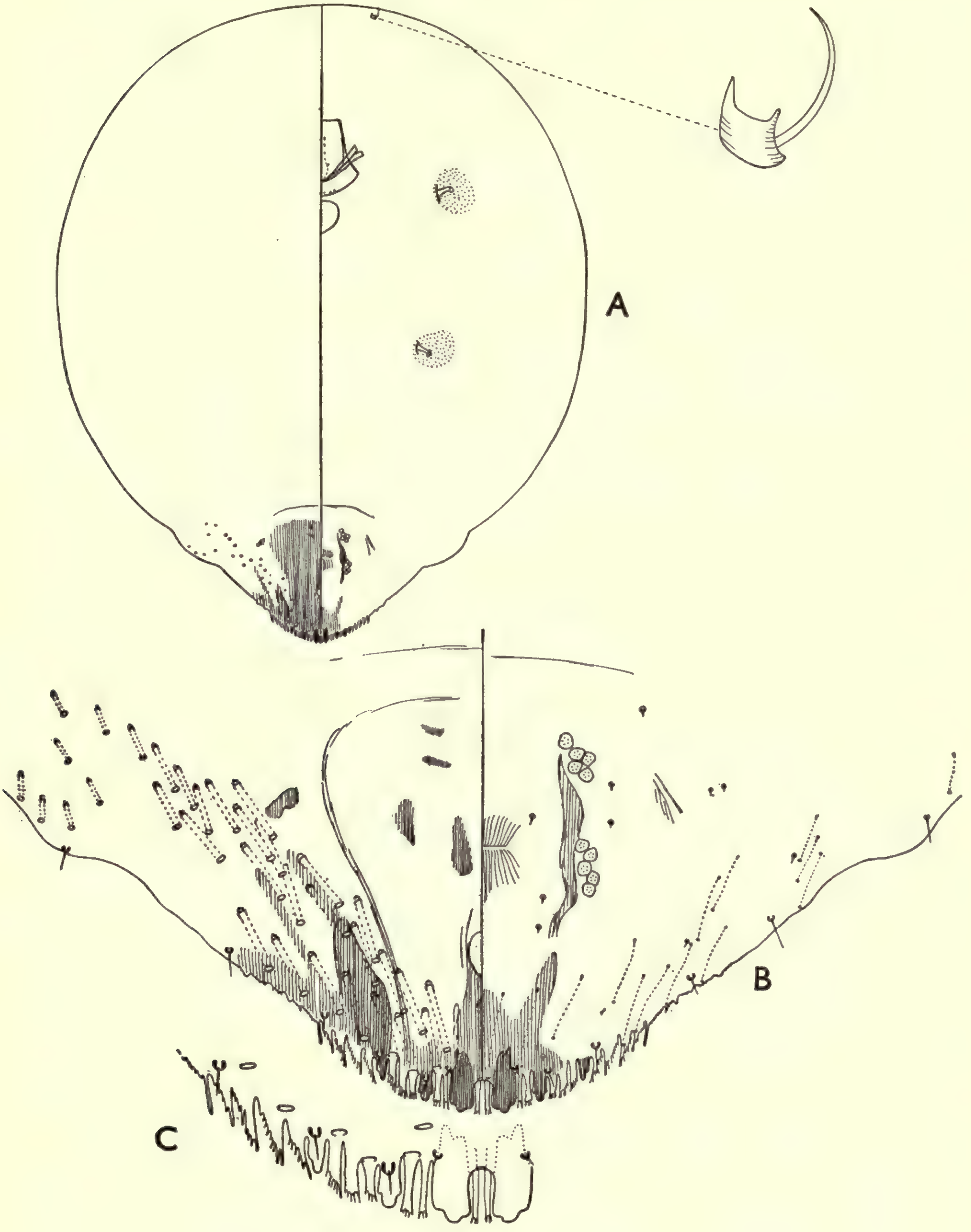

FIG. 10. *Aspidiotus selangorensis* sp. n.

Pygidium with 3 pairs of well developed lobes : median lobes set apart by a distance rather less than the width of one, longer than wide, rounded apically and notched on both inner and outer margins ; second lobes similar to median pair but smaller and third lobes similar but smaller again. Two plates between median lobes and between median and second lobes ; 3 between second and third and 5 beyond third lobes. All plates of the fringed type normal to the genus. Perivulvar pores in 4 groups each containing on the average 5 pores (range 2–8 in 8 examples). Anal orifice nearer apex than base of pygidium and set nearly 3 times its length from apex of pygidium. Dorsal ducts short, relatively numerous and scattered throughout the submarginal region as far as segment 3 ; with 2 or 3 ducts marginally on segment 3. Ventral surface of pygidium with a few submarginal microducts.

Holotype. ♀. Malaya : Kuala Lumpur, on *Adiantum fergusoni* (Polypodiaceae), 1.vi.1926 (*G. H. Corbett*).

Paratypes. Malaya : 7 ♀, same data as holotype.

Aspidiotus selangorensis is very close to *A. hederae* (Vallot) and *A. spinosus* Comstock but the pygidial ducts are longer than in *A. hederae* and shorter than in *A. spinosus*. The large, well defined, if faintly sclerotized areas around the spiracles are not found in either of the other two species. It differs further from *A. hederae* in having the pygidial lobes notched on their inner edges and from *A. spinosus* in possessing a larger anal orifice set further from the apex of the pygidium.

Chortinaspis fissurella sp. n.

(Text-fig. 11)

Scale of adult female subcircular, moderately convex and dark brown in colour. Exuviae of a similar colour set within the margin but not central. Ventral scale thin but well developed. Diameter of scale about 1·0 mm.

Male scale not observed.

Adult female turbinate in form with membranous dermis. Antennal tubercles apparently set in shallow pits, each carrying a single stout curved seta. Anterior spiracles partly circumscribed by a loose arc of minute tubular ducts, posterior spiracles with a similar arc containing fewer ducts. Median pygidial lobes well developed, rounded apically, each falling away laterally, set close together and each with a prominent sclerotic basal projection. Other lobes wanting but margin of segments 6 and 7 with a somewhat castellated outline. Pygidium with small dorsal ducts set in furrows in a manner typical of the genus ; scattered ventral ducts occur submarginally on the pygidium and free abdominal segments. Anal orifice nearer apex than base of pygidium. Perivulvar pores wanting.

Holotype. ♀. Pakistan : Murree, on *Imperata cylindrica* (Gramineae), 25.ii.1960 (Comm. Inst. Biol. Control, Rawalpindi, No. 212).

Paratypes. Pakistan : 4 ♀, same data as holotype, Nos. 211, 212.

This species seems to belong quite definitely to the genus *Chortinaspis* but it differs in several respects from all the species at present placed in that genus. Like *C. consolidata* Ferris the pygidium of *C. fissurella* is entirely without plates and only the median lobes are represented. In *C. consolidata* these are fused whereas in *C. fissurella* they are separate even though they are very close together.

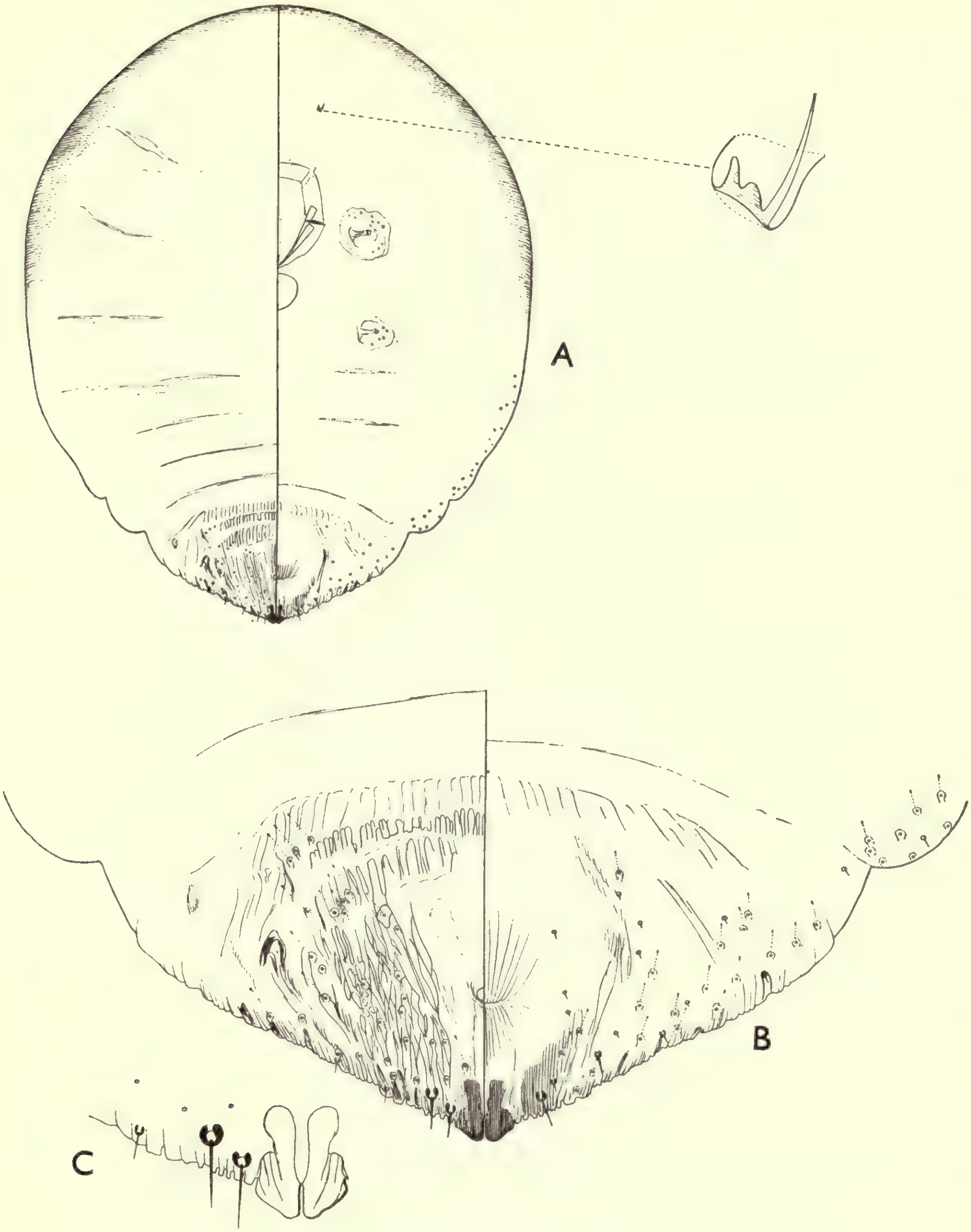

FIG. 11. *Chortinaspis fissurella* sp. n.

Pseudaonidia corbetti sp. n.

(Text-fig. 12)

Characters of the scale not known.

Body of the adult female when mounted 1·5–2·0 mm. long and 1·0–1·4 mm. wide, uniformly moderately sclerotized at maturity ; median dorsal areas of prepygidial segments transversely striated. Pygidium with 4 pairs of well developed lobes ; median pair large, squat, flatly rounded with faint notches on either side ; other lobes slender, as long as the median lobes but less than half their width, notched on both inner and outer margins ; second and third lobes much the same size as each other but fourth lobes smaller. Two plates between median lobes and between median and first lobes, 3 plates in the other 2 interlobal spaces ; all plates much the same length as the lobes, narrow, terminated by 3 or 4 finger-like processes. Short club-shaped paraphyses, not exceeding lengths of lobes, occur between the median lobes, 1 from the inner angle of each lobe and 1 each in the other 3 interlobular spaces on each side. Dorsal ducts very numerous submarginally on the prepygidial segments ; on the pygidium they are arranged in definite submarginal series. Dorsal central area of pygidium showing a conspicuous reticulate ornamentation. Perivulvar pores in 2 large groups each containing some 50 or more pores. Anal orifice small. Ventral surface with very few micropores.

Holotype. ♀. MALAYA : Balik Pulau, on *Myristica fragrans* (Myristicaceae), 17.vi.1927 (*G. H. Corbett*) (Dept. Agric., Kuala Lumpur, No. 3890).

Paratypes. MALAYA : 2 ♀, same data as holotype. MALAYA : Kuala Lumpur, on *Eugenia malaccensis* (Myrtaceae), 5 ♀, 7.x.1927 (Dept. Agric, Kuala Lumpur, No. 4173).

P. corbetti comes close to *P. paeoniae* Cockerell and *P. pavettae* described by Balachowsky (1953). It differs from both in the shape of the pygidial lobes, the nature of the lobes, the longer ducts on the pygidium and the presence of a pair of paraphyses between the median lobes. Subsequently Balachowsky (1958) transferred *P. pavettae* to *Duplaspidiotus*. The fact that two species as close as *P. paeoniae* and *P. pavettae* should be assigned to different genera indicates that there is no sharp dividing line between the two genera. A consideration of the types of the two genera suggests, however, that *P. corbetti* is nearer to that of *Pseudaonidia*, as is also *P. paeoniae*, and that *P. pavettae* could more properly remain in the genus *Pseudaonidia*. Apart from the paraphyses in these three species which are short, inconspicuous and quite unlike the typical conspicuously knobbed, large paraphyses of *Duplaspidiotus*, the pygidial lobes in number and shape, and the general facies, favour *Pseudaonidia* rather than *Duplaspidiotus*.

Rhizaspidiotus marginalis sp. n.

(Text-fig. 13)

Scale of adult female rather thick, more or less circular, white and low convex. Exuviae marginal, golden yellow or pale brown, coated with a film of white secretionary matter. Ventral scale well developed, often remaining attached to the host plant. Diameter about 1·9 mm.

Male scale white and narrowly elongate oval.

Body of fully developed adult female broadly pyriform, about 2·8 mm. long and 2·1 mm. wide. Dermis of old adults sclerotized except for the second and third free abdominal segments and the anterior part of the pygidium which are less so. Antennal tubercles each carrying a single long curved seta. Anterior spiracles with a large group of pores about 50 in number ; posterior spiracles with rather fewer. Margin of body, anterior to first abdominal segment, with a conspicuous

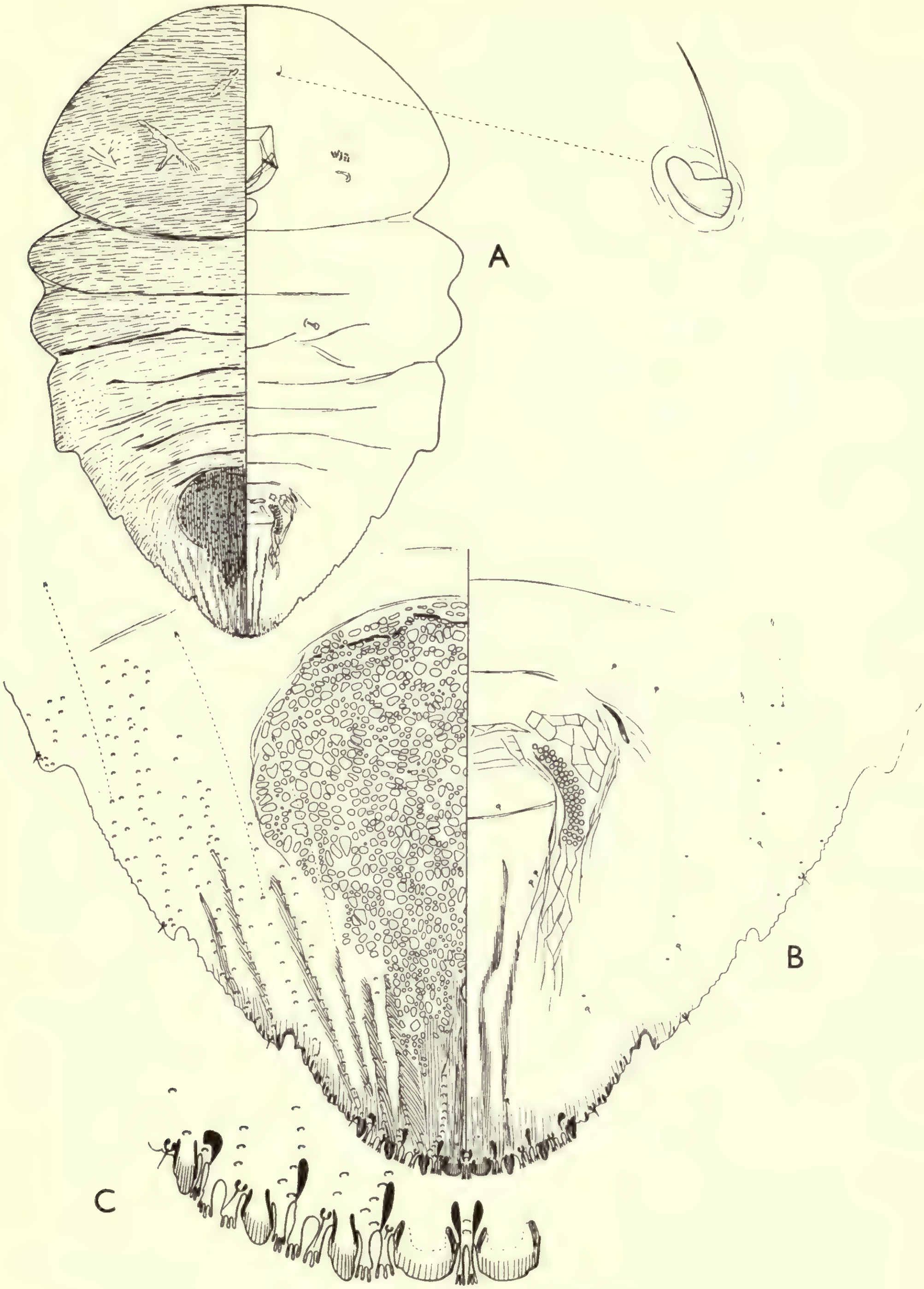

FIG. 12. *Pseudaonidia corbetti* sp. n.

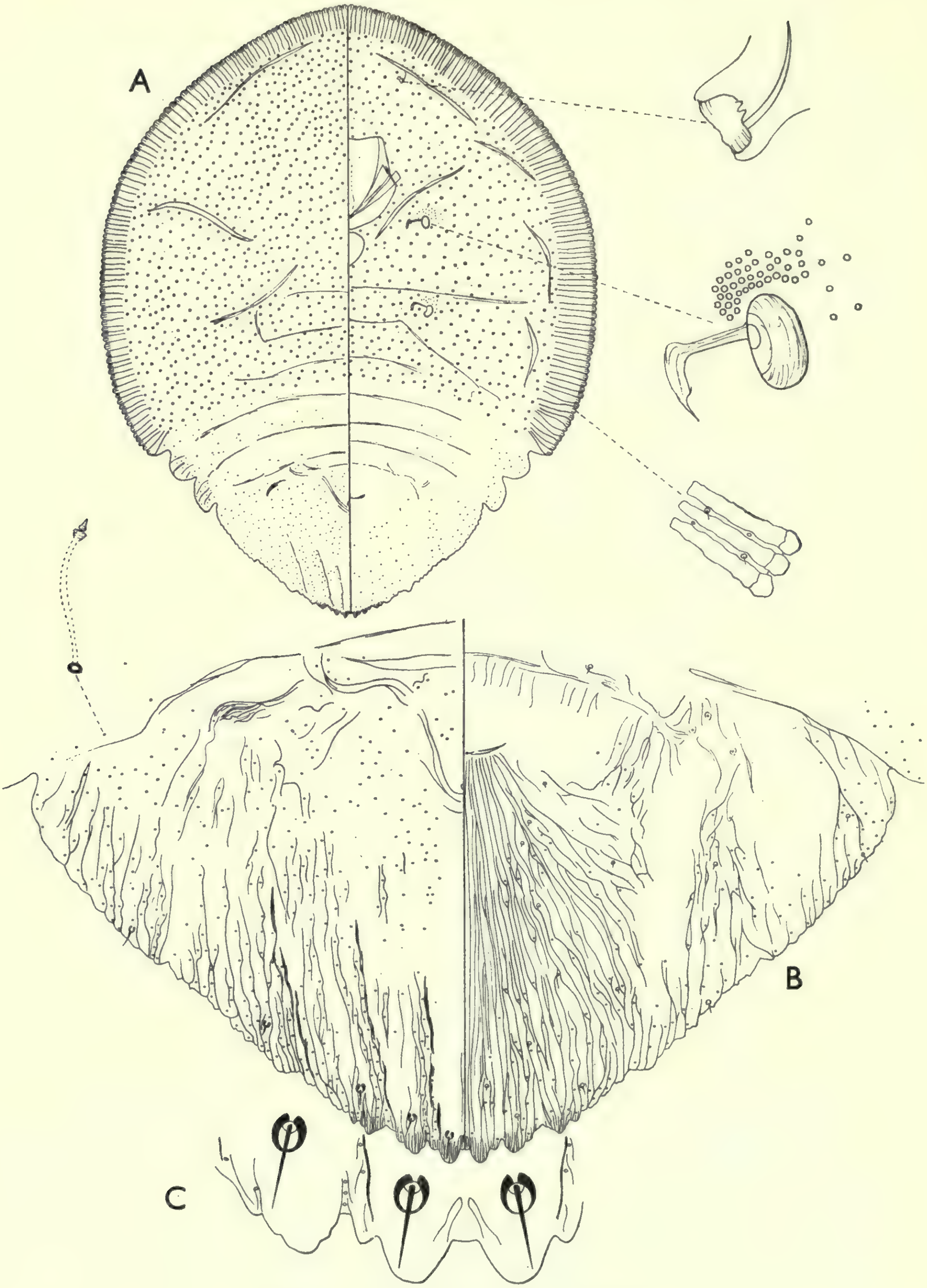

FIG. 13. *Rhizaspidiotus marginalis* sp. n.

uniformly wide band of striations ; these striations or folds are set at right angles to the margin and give it a scalloped outline. Pygidium with 3 pairs of lobes ; median pair dome-shaped with deep notches on inner and outer edges ; second lobes only slightly smaller and of similar shape ; third lobes slightly smaller again, bluntly pointed, lacking a notch on the inner margin. A single rather stout seta arising from the vicinity of the base of each lobe. Pygidium without plates or gland spines but with numerous folds and furrows running in from the margin of the pygidium and with numerous scattered minute one-barred ducts on both surfaces. Anal orifice very small, situated at base of pygidium.

Holotype. ♀. MALAYA : Kepong, on fruits of *Calamus* sp. (Palmae), 17.xii.1954 (Dept. Agric., Kuala Lumpur, No. 17993).

Paratypes. MALAYA: 17 ♀, same data as holotype.

The generic position of this species is not clear. In some respects it suggests a *Rugaspidiotus*, a genus which Ferris (1938) included in the Odonaspidini with some doubt. The present species, however, has not the bivalve type of exuviation characteristic of that genus. The presence of three distinct pairs of lobes, the median lobes being well separated from each other, and ducts that are clearly one-barred, favours the Aspidiotini rather than the Odonaspidini. It would appear to be more nearly congeneric with *Rhizaspidiotus* to which genus it is tentatively assigned. It differs, however, from all the known species of that genus and cannot be said to be very close to any one of them. It completely lacks pygidial plates and in this respect resembles *R. donacis* (Leonardi), *R. caraganae* (Kiritchenko) and *R. bivalvatus* Goux in which also the median lobes are distinctly separated, but it differs from these in the very striking ornamentation of all but the pygidium and abdominal segments and the relatively minute anal opening set towards the base of the pygidium.

Recently Mamet (1959) described a new genus, *Antakaspis*, from Madagascar for which he erected a new tribe. This is said to possess some of the characteristics of the Odonaspidini but is related to the Diaspidini by virtue of its method of exuviation and the presence of two-barred ducts and one of the characters of the tribe is the occurrence of pygidial lobes in the adult and second stage female. There are some species of *Odonaspis*, however, with equally well developed lobes. *R. marginalis* bears some resemblance to *Antakaspis terminaliae* Mamet but differs in having one-barred ducts and in lacking pygidial paraphyses.

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ON THE GENERA OF INDO-PAKISTAN CLEONINAE AND HYLOBIINAE (COLEOPTERA : CURCULIONIDAE)

NAZIR AHMAD ASLAM

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LONDON : 1963

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Pp. 45–66 ; 29 *Text-figures*

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CONTENTS

SYNOPSIS

The subfamilies Cleoninae and Hylobiinae are redefined in the light of studies of genera occurring in Indo-Pakistan. Keys are given to these genera and their characters and relationships discussed.

I. CLEONINAE

1. REVIEW OF THE LITERATURE

Lacordaire (1863) recognized eight genera, including *Peribleptus* Schönherr (Lixides) as occurring in Indo-Pakistan. Chevrolat (1873) described five new genera *Pycnodactylus, Tetragonothorax, Exochus, Neocleonus* and *Xanthochelus* now represented in this area. The name *Exochus* was preoccupied and was changed to *Epilectus* by Faust (1904) and finally to *Eurycleonus* by Bedel (1907). Faust (1904) revised the " Cleonides vrais " of the world and described the genera *Dicranotropis, Cosmogaster, Atactogaster* and *Nemoxenus,* all represented in Indo-Pakistan. He also discussed the tribe " Lixides ", gave a key to genera in groups and emphasized the importance of a revision of " Lixides " and " Cleonides " together in order to obtain a satisfactory understanding of the group. Bedel (1907) changed *Dicranotropis* Faust (*nec* Fieber) to *Ammocleonus,* and sank *Nemoxenus* Faust as a synonym

of *Atactogaster* Faust. Desbrochers (1904) described two new genera, *Hypolixus* and *Gasteroclisus* in Lixini. These genera were reduced to subgeneric level in Junk's Catalogue and quite wrongly applied in that work (see Marshall, 1939 : 566). I treat them as genera here. Marshall (1932) and Solari (1941) discussed some characters separating this subfamily from the Hylobiinae.

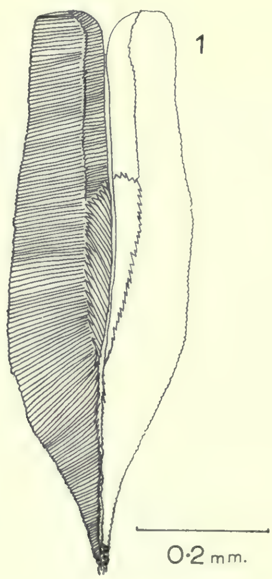
In addition to the above literature the work of Hochhut (1847), Motschulsky (1850–60), Faust (1892, 1894–95), Petri (1904, 1905 and 1920), Reitter (1912) and Kôno (1929) may also be mentioned.

In the Catalogus Coleopterorum (Csiki, 1934) the genera *Pycnodactylus*, *Tetragonothorax*, *Ammocleonus*, *Cosmogaster*, *Atactogaster*, *Neocleonus* and *Xanthochelus* are considered as subgenera of *Cleonus* but all these are taken as valid genera for the purpose of this study, since it would otherwise be difficult to give an accurate definition of *Cleonus*.

It is proposed to redefine the subfamily more precisely and give a key to the tribes and genera.

2. MATERIAL AND METHODS

It was not always possible to study specimens of the type species since the type species has not been fixed in all cases, and even when fixed, specimens were not always available for study in the British Museum (Natural History). The following species were studied. Type species are marked with an asterisk.



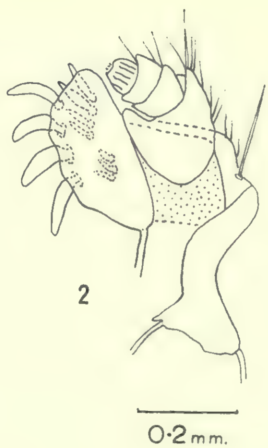


FIG. 1. Proventricular blade of *Gasteroclisus augurius*.

FIG. 2. Maxilla of *Neocleonus sannio*.

1. *Microlarinus* Hochhut
   **M. rhinocylloides* Hochhut
2. *Lachnaeus* Schönherr
   **L. crinitus* Boheman
3. *Larinus* Germar
   **L. cynarae* (Fabricius)
   L. assamensis Marshall
4. *Lixus* Fabricius
   **L. paraplecticus* (Linnaeus)
   L. seriesignatus Boheman
5. *Gasteroclisus* Desbrochers
   **G. augurius* (Boheman)
   G. binodulus (Boheman)
   G. arcurostris Petri
6. *Hypolixus* Desbrochers
   **H. nubilosus* (Boheman)
   H. truncatulus (Fabricius)
7. *Pachycerus* Schönherr
   P. varius (Herbst)
   P. sellatus Faust
   P. cynoglossi Marshall
8. *Xanthochelus* Chevrolat
   X. longus Chevrolat
   X. faunus (Olivier)
9. *Cleonus* Schönherr
   **C. piger* (Scopoli)
10. *Mecaspis* Schönherr
   **M. emarginatus* (Fabricius)
   M. sexguttatus (Redtenbacher)
11. *Lixocleonus* Marshall
   **L. incanus* Marshall
12. *Neocleonus* Chevrolat
   N. sannio (Herbst)
13. *Ammocleonus* Bedel
   A. hieroglyphicus (Olivier)
   A. ramakrishnai Marshall
   A. aschabadensis (Faust)
14. *Tetragonothorax* Chevrolat
   **T. retusus* (Fabricius)
15. *Pycnodactylus* Chevrolat
   **P. tomentosus* (Fabricius)
   P. albogilvus (Gyllenhal)
16. *Cosmogaster* Faust
   C. lateralis (Gyllenhal)
17. *Atactogaster* Faust
   A. orientalis (Chevrolat)
   A. dejeani (Faust)
   A. (*Nemoxenus*) *zebra* (Chevrolat)
18. *Liocleonus* Motschulsky
   **L. clathratus* (Olivier)
   L. umbrosus Chevrolat
19. *Conorhynchus* Motschulsky
   C. brevirostris (Gyllenhal)
   C. perforatus (Faust)
20. *Menecleonus* Faust
   M. signaticollis (Gyllenhal)
21. *Bothynoderes* Schönherr
   **B. nubeculosus* Boheman
   B. foveicollis Gebler
22. *Eurycleonus* Bedel
   E. baluchicus (Marshall)

In drawing the mouthparts, clothing setae have been omitted. All drawings were made with a camera lucida.

As regards terminology, Ting (1936) has been followed to define mouthparts and Nüsslin (1911) for the proventriculus. A sclerite in front of the prementum is termed ligula in the text.

3. DEFINITION OF THE SUBFAMILY CLEONINAE

Rostrum longer than broad (except *Microlarinus*); usually broadened at apex in tribe Cleonini and not so in tribe Lixini. Scrobes reaching apex and more or less visible anteriorly from above in Cleonini, neither reaching apex nor visible from above in Lixini.

Maxilla (fig. 2) with mala having stout teeth, placed in sockets on inner margin, and on ventral plane; maxillary palps three-segmented. Labium (fig. 5) with strongly sclerotized transverse

ligula apical to prementum ; labial palps very small, ventral in position and one to three segmented, first segment stout and usually with a stout seta.

Metepimera exposed so that hind coxae do not touch elytra.

Trochanters with at least one erect seta. Femora weakly and gradually claviform. Tibiae rounded, with apical inner mucro ; external fringe of corbels apical.

Elytra usually excavated and overlapping base of prothorax (except *Bothynoderes* and *Eurycleonus*).

Wings (fig. 4) folded distal to middle ; vein M running straight into r–m (except *Microlarinus*) ; A4 strongly sclerotized and A5 may reach A4 posteriorly.

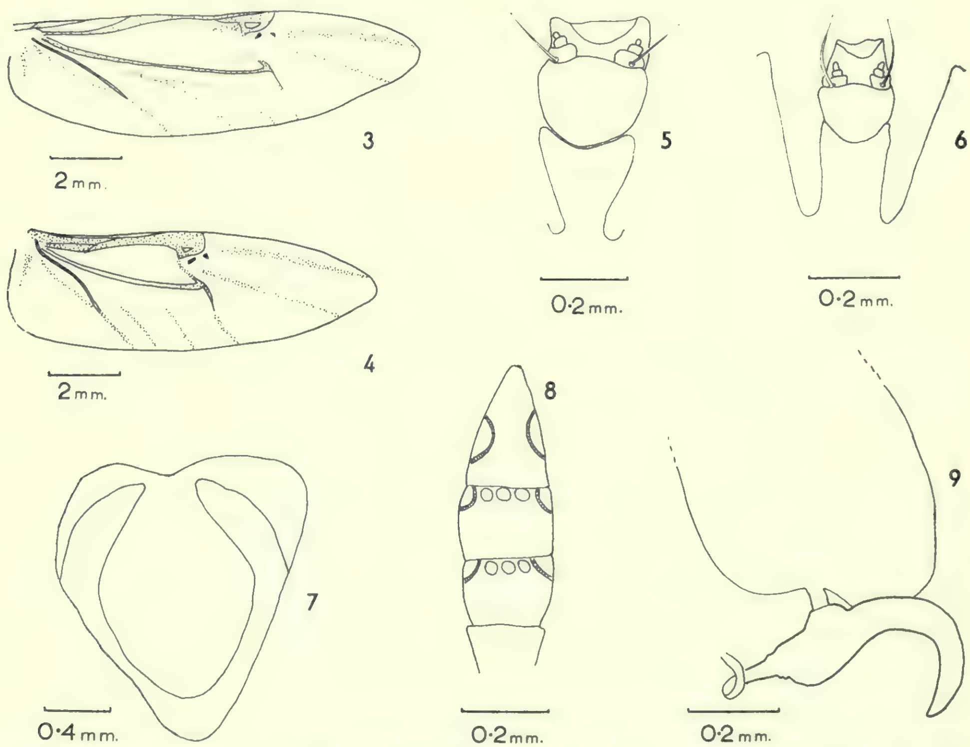
Intercoxal process of third abdominal sternum (first visible ventrite) shorter than the diameter of hind coxae.

Proventriculus (fig. 1) without grinding plates. Blades paired ; true retaining bristles absent (some long anterior brushes may simulate paired retaining bristles) ; brushes along entire length, although usually shorter anteriorly ; external intermedial fringe not transversely striate. Crop with scattered bristles. Cardiac valve without bristles.

Spermathecal capsule usually with more or less marked collum and ramus ; duct long ; gland vesiculate and of variable shape.

One stalked symbiont-carrying structure present on each side of vagina and opening on membrane between eighth and ninth sternites.

Female genitalia with coxites and styli.



FIGS. 3–9. Wing of : 3, *Lixus paraplecticus* ; 4, *Neocleonus sannio*. Labium of : 5, *Gasteroclisus binodulus* ; 6, *Hypolixus truncatulus*. 7, Eighth sternum of female of *Tetragonothorax retusus*. 8, Antennal club of *Neocleonus sannio*. 9, Spermatheca of *Bothynoderes foveicollis*.

4. KEY TO THE TRIBES AND GENERA OF CLEONINAE

1 (12) Rostrum cylindrical, more or less shining ; scrobes not reaching apex (almost reaching it in *Microlarinus*), not visible anteriorly from above ; usually without distinct rostral carina or furrow. Antennal club without placoidal sensilla. Tibiae having corbels without distinct mucral lamella ; tarsi broadened up to third segment and spongy beneath . . . . . . Tribe **LIXINI**

2 (7) Prothorax shining, subconical ; prosternum longer than diameter of fore coxae. Tibiae without premucro. Wing (fig. 3) with vein A2 and A3 stalked basally. (Blades of proventriculus much narrower.)

3 (6) Scrobes slightly separated beneath ; their upper margins not touching lower margins of eyes. Pronotum almost truncate anteriorly. Postmentum (fig. 5) much narrower at base than at apex. Declivity teeth present on anterior part of proventricular blade.

4 (5) Rostrum narrowed to apex (parallel-sided in *G. arcurostris*) ; with a seta behind articulation of mandibles. Eyes acuminate below. Scrobes subcontiguous beneath. Prothorax with a lateral depression and tubercle at about middle. Elytra more or less impressed at declivities. Fore tibiae curved externally at base. Intercoxal process of third abdominal sternum ogival. Proventriculus with blades less separated at medians anteriorly
GASTEROCLISUS Desbrochers

5 (4) Rostrum almost parallel-sided ; without a seta behind articulation of mandibles. Eyes rounded below. Scrobes somewhat separated beneath. Prothorax without such depression or tubercle. Elytra gradually sloping to apex. Fore tibiae straight externally. Intercoxal process of third abdominal sternum acuminate. Proventriculus with blades more separated at medians anteriorly
LIXUS Fabricius

6 (3) Scrobes widely separated beneath, their upper margins touching lower margins of eyes. Pronotum arcuate anteriorly. Postmentum (fig. 6) hardly narrower at base than apex. (Tibiae with an apical tooth on inner margin of apical fringe. Rostrum narrowed to apex.) Without declivity teeth on proventricular blade . . . . ***HYPOLIXUS*** Desbrochers

7 (2) Prothorax not like *Lixus* ; prosternum as long as or shorter than diameter of fore coxae. Tibiae with or without premucro. Wing with veins A2 and A3 not stalked basally or absent.

8 (9) Upper margin of scrobe touching lower margin of eye. Scape of antenna as long as funicle. Prothorax very transverse ; prosternum without a fovea in front of each coxa. Scutellum distinct. Metepisternum very broad. Tibiae without premucro. Body without long erect setae. . . ***LARINUS*** Germar

9 (8) Upper margin of scrobe not touching lower margin of eye. Scape shorter than funicle. Prothorax not transverse ; prosternum with a fovea in front of each coxa. Scutellum not visible. Metepisternum narrow. Tibiae with premucro. Body with long erect setae.

10 (11) Rostrum parallel-sided, longer than broad. Seventh segment of funicle free from club. Fore coxae with long internal hairs ; tarsi with long erect hairs. Intercoxal process of third abdominal sternum rounded ***LACHNAEUS*** Schönherr

11 (10) Rostrum narrowed to apex and not or scarcely longer than broad. Seventh segment of funicle contiguous with club. Fore coxae and tarsi without long hairs. Intercoxal process of third abdominal sternum acuminate
MICROLARINUS Hochhut

12 (1) Rostrum usually short, scaly and not cylindrical in cross section, if so then upper margin of scrobe excavated or with trace of median groove or carina ; scrobes reaching apex and visible anteriorly from above ; usually with rostral carina or

furrow. Antennal club with placoidal sensilla (fig. 8). Tibiae having mucral lamella; intercoxal process of third sternum usually rounded. Body with scales (except *Lixocleonus*) . . . . Tribe **CLEONINI**

13 (40) Elytra projecting over base of prothorax and excavated at base.

14 (15) Rostrum more or less cylindrical in transverse section and narrowed to apex. (Eyes acuminate below. Second segment of funicle distinctly longer than first) ***CONORHYNCHUS*** Motschulsky (= ***TEMNORHINUS*** Chevrolat), **syn. n.**

15 (14) Rostrum not narrowed to apex, more or less broadened at apex.

16 (21) Rostrum with a median furrow or at least trace of it. (Premucro present on fore tibiae at least. Postmentum longer than prementum. Vein A5 reaching A4).

17 (20) Upper margin of scrobe touching lower margin of eye. Scape shorter than funicle. (All tarsal segments more or less spongy beneath.)

18 (19) Rostrum 4-carinate. Prosternum as long as diameter of fore coxae. Fore tibiae without apical projection. Abdominal sterna with irregular bare spots. Wing with veins A2 and A3 stalked basally. Blades of proventriculus narrow and parallel-sided anteriorly . . . . ***CLEONUS*** Schönherr

19 (18) Rostrum cylindrical, without any carinae. Prosternum shorter than diameter of fore coxae. Fore tibiae with an apical projection interrupting the fringe. Abdominal sterna without any spots. Wings with veins A2 and A3 independent. Blades of proventriculus slightly narrow anteriorly and sinuate antero-laterally . . . . ***LIOCLEONUS*** Motschulsky

20 (17) Upper margin of scrobe not touching lower margin of eye. Scape longer than funicle. (Abdomen with transverse rows of bare spots) ***XANTHOCHELUS*** Chevrolat

21 (16) Rostrum without a median furrow and with at least one carina.

22 (25) Abdominal sterna with at least three pairs of basal lateral foveae. First segment of maxillary palp as long as or longer than broad.

23 (24) Upper margin of scrobe touching lower margin of eye. Fourth abdominal sternum as long as or longer than fifth and sixth together; sterna with bare spots regular or irrorated. Wing functional, veins A2 and A3 stalked. Labial palps one-segmented. Proventriculus without declivity teeth ***PACHYCERUS*** Schönherr

24 (23) Upper margin of scrobe not touching lower margin of eye. Fourth abdominal sternum shorter than fifth and sixth together; sterna without bare spots. Wings rudimentary. Labial palps three-segmented ***ATACTOGASTER*** Faust (=***NEMOXENUS*** Faust), **syn. n.**

25 (22) Abdominal sterna never with three pairs of basal foveae. First segment of maxillary palp transverse.

26 (27) Scrobes subcontiguous beneath. Seventh segment of funicle distinct from club. Prosternum longer than diameter of fore coxae. Scutellum large and triangular. (Abdomen irrorated with black spots.) Proventriculus with blades more separated anteriorly at medians . . . . . ***MECASPIS*** Schönherr

27 (26) Scrobes separated beneath. Seventh segment of funicle contiguous with club. Prosternum shorter than or as long as diameter of fore coxae. Scutellum small or not visible. Proventriculus with blades less separated anteriorly at medians.

28 (29) Tibiae without distinct mucral lamella. All tarsal segments with spongy soles. Fourth abdominal sternum clearly longer than fifth and sixth together; abdomen irrorated with bare spots. Labial palps one-segmented. (Wing with vein A2 and A3 stalked basally. Stylus of female genitalia transverse) ***LIXOCLEONUS*** Marshall

29 (28) Tibiae with more or less distinct mucral lamella; all tarsal segments never spongy beneath Fourth abdominal sternum not longer than fifth and sixth together; abdomen not irrorated with bare spots. Labial palps two or three-segmented.

30 (37) Second segment of funicle not longer than first. Fore tibiae without premucro ; second hind tarsal segment equal to or slightly shorter than third. Abdominal sterna with brown spots. Collum and ramus of spermatheca not at right angles to each other. (Wing (fig. 4) with vein A2 and A3 not stalked basally.)

31 (34) Rostrum with median carina forked behind (forked on both ends in *Ammocleonus*). (Frons with a longitudinal furrow enclosed by fork of rostral carina.) Postmentum longer than prementum. Fourth sternum shorter than fifth and sixth together ; eighth sternum in female without anterior process. Stylus in female genitalia longer than broad. (Upper margin of scrobe touching lower margin of eye.)

32 (33) Rostrum with epistome more well-defined. Scape longer than funicle. Fore tibiae straight externally ; tarsi sublinear. Vein A5 not reaching A4. Labial palps two-segmented . . . . ***AMMOCLEONUS*** Bedel

33 (32) Rostrum with epistome less well-defined. Scape as long as funicle. Fore tibiae curved at apex externally ; third segment of tarsi broader than second. Vein A5 reaching A4. Labial palps three-segmented ***NEOCLEONUS*** Chevrolat

34 (31) Rostrum with median carina not forked behind. Postmentum shorter than prementum. Fourth sternum longer than or as long as fifth and sixth together ; eighth sternum in female with more or less distinct anterior process. Stylus of female genitalia transverse. (Vein A5 reaching A4 posteriorly. Rostrum with two basal furrows.)

35 (36) Upper margin of scrobe touching lower margin of eye. Prosternum with neither a fovea nor protuberance in front of each coxa. Third abdominal sternum with a brown band behind each coxa and almost as long as metasternum. Labial palp two-segmented. Vein A2 and A3 present ***PYCNODACTYLUS*** Chevrolat

36 (35) Upper margin of scrobe not touching lower margin of eye. Prosternum with a fovea and protuberance in front of each coxa. Third abdominal sternum without any band behind each coxa and longer than metasternum. Labial palps three-segmented. Only vein A2 present . . . ***COSMOGASTER*** Faust

37 (30) Second funicular segment distinctly longer than first. Fore tibiae with a premucro ; second hind tarsal segment longer than third. Abdominal sterna with bare spots. Collum and ramus of spermatheca (fig. 9) at right angles to each other.

38 (39) Upper margin of scrobe touching the eye. Eyes rounded beneath. Prosternum with a fovea in front of each coxa. Tibiae without long hairs. Scales on elytra lanceolate. Intercoxal process of third abdominal sternum narrower than length of metasternum ; eighth sternum in female (fig. 7) without anterior process . . . . ***TETRAGONOTHORAX*** Chevrolat

39 (38) Upper margin of scrobe not touching lower margin of eye. Eyes acuminate below. Prosternum without a fovea in front of each coxa. Tibiae with long hairs. Scales on elytra brush-like. Intercoxal process of third abdominal sternum broader than length of metasternum ; eighth sternum in female with anterior process . . . . ***MENECLEONUS*** Faust

40 (13) Elytra neither projecting nor excavated at base. (Upper margin of scrobe not touching lower margin of eye. Second segment of funicle distinctly longer than first. Fourth abdominal sternum shorter than fifth and sixth together ; sterna with bare spots. Proventriculus abruptly narrowed anteriorly).

41 (42) Eyes acuminate below. Third segment of funicle transverse. Prothorax more or less bisinuate at base. Fore tibiae with premucro ; tarsal segments not bilobed. Metasternum as long as or longer than diameter of mid coxae. Eighth sternum in female without distinct narrow anterior process. Veins A2 and A3 not stalked basally . . . . . . ***BOTHYNODERES*** Schönherr

42 (41) Eyes rounded below. Third funicular segment not transverse. Prothorax rounded at base. Tibiae without premucro ; all tarsal segments bilobed. Metasternum shorter than diameter of mid coxae. Eighth sternum in female with distinct narrow anterior process. Wings rudimentary ***EURYCLEONUS*** Bedel

5. DISCUSSION

A proper understanding of the affinities of the Cleoninae cannot be obtained from the Indo-Pakistan representatives alone, and the suggestions made below are no more than a limited contribution to the problem of the natural classification of the Cleoninae. Even within the Indo-Pakistan fauna it seems that many previously recognized genera are heterogeneous assemblages. Definitive generic limits can be assigned only after a revision of all the Indo-Pakistan species. The present attempt to define the genera is based on types which have been fixed and are in the British Museum (Natural History), supplemented (where types have not been fixed) by a study of species which may be considered as types of their respective genera.

1. The Indo-Pakistan Cleoninae form a distinct and easily definable group of weevils having in common the following characteristic features : (i) mala of maxilla with stout socketed inner teeth and some ventral teeth ; (ii) ligula transverse and apical to prementum ; (iii) labial palps small, 1–3 segmented, and ventral in position ; (iv) metepimeron separating hind coxa from elytron ; (v) external fringe of tibiae apical ; (vi) hind wing folded distal to the middle ; (vii) crop with scattered bristles ; (viii) symbiont-carrying structure present on each side of membrane between eighth and ninth sternites.

2. The distinctions between the genera of the Cleoninae are much less clear. It is possible, however, to distinguish two tribes, the Lixini (comprising the genera *Microlarinus*, *Lachnaeus*, *Larinus*, *Lixus*, *Gasteroclisus* and *Hypolixus*) and the Cleonini (consisting of all the others). The Lixini is a more homogeneous group than the Cleonini, and may be separated from them by the following characters : (i) general shape ; (ii) cylindrical rostrum, rarely broad at apex ; (iii) scrobes neither reaching apex of rostrum nor visible anteriorly from above ; (iv) elytra more or less hairy or with powdery substance (scaly in Cleonini) and (v) corbels without mucral lamella. There are, however, in both tribes a few genera and species which are transitional in respect of some characters. Thus, in addition to the exceptions already mentioned by Faust (1904), *Microlarinus* has scrobes reaching the apex of the rostrum, *Conorhynchus* and some species of *Xanthochelus*, have a cylindrical rostrum, and *Lixocleonus* has small hairs on the elytra and corbels without a mucral lamella.

3. The Lixini contains a group of three rather closely related genera, *Lixus*, *Gasteroclisus* and *Hypolixus*, all of which have in common : (i) subconical prothorax ; (ii) prosternum longer in front than diameter of fore coxae and (iii) 3-segmented labial palps. These genera also possess certain primitive characters ; (i) tarsal segments spongy beneath and (ii) veins A2 and A3 stalked basally. Of the remaining genera of Lixini, *Larinus* appears to be most closely related to the *Lixus*-group, since it lacks a premucro on the tibiae and has broad tarsal segments which are spongy beneath. *Microlarinus* and *Lachnaeus*, on the other hand, seem quite distinct from the other genera of Lixini but resemble each other in their small size, long erect body-hairs

and premucro and tarsi less spongy beneath (the last character suggesting a resemblance with *Lixocleonus* of the Cleonini). Of the two, *Lachnaeus* seems closer to the other Lixini than *Microlarinus*.

4. The Cleonini include some genera which seem only distantly related to each other, but a few groups of allied genera can nevertheless be recognized. The first of these contains the five genera *Pachycerus*, *Xanthochelus*, *Cleonus*, *Mecaspis* and *Lixocleonus*, which have in common : (i) broad spongy tarsi ; (ii) veins A2 and A3 stalked basally or, in *Mecaspis*, tending to meet basally ; (iii) the anterior process of the eighth abdominal sternum distinct or intermediate. Although these characters suggest affinities with the *Lixini*, the group also shows three characters which recur individually in other genera of Cleonini : (i) first segment of funicle longer than second (or equal in *Lixocleonus*) ; (ii) three-segmented labial palps (one-segmented in *Lixocleonus*) ; (iii) anterior process of eighth sternum distinct or intermediate.

5. A second group of genera in the Cleonini comprises *Neocleonus*, *Ammocleonus* and *Tetragonothorax* which have in common : (i) eighth sternum without anterior process (a character found nowhere else) ; (ii) upper margin of scrobes touching lower margin of eyes ; (iii) median rostral carina complete. The characters of *Neocleonus* suggest a relationship between this group and the preceding one, since it has spongy " soles " to the tarsi ; but veins A2 and A3 are independent of each other. A different relationship is perhaps indicated by the resemblance between *Tetragonothorax* and *Conorhynchus*.

6. *Conorhynchus* has affinities with a wide range of genera but is best considered as a member of a third group which also contains *Bothynoderes* and *Menecleonus* and to which *Tetragonothorax* might be added. These have (i) the second segment of the funicle distinctly longer than the third and (ii) the second hind tarsal segment longer than the third. The wingless genus *Eurycleonus* also deserves mention here since its second funicular segment is longer than the first, but it is distinct in having all the tarsal segments bilobed and the metasternum shorter than the diameter of the mid coxae and as long as the intercoxal process. Otherwise, *Eurycleonus* shows some points of resemblance with *Bothynoderes* (elytra neither excavated nor projecting at base ; with brush-like scales) and others with *Atactogaster* (wingless ; eighth sternum with long anterior process). Of the genera which form this third group *Conorhynchus* differs from the others in having two-segmented labial palps and other characters already mentioned. The subgenus *Menecleonus* Fst., moreover, differs from *Bothynoderes* in having (i) elytra excavated and projecting at base ; (ii) veins A2 and A3 stalked basally ; (iii) A5 reaching A4 ; (iv) tarsi with stout bristles beneath ; (v) blades of proventriculus abruptly truncated in front. It is therefore here raised to generic level with *B. signaticollis* Gyll. as its type.

7. The remaining Cleonine genera (i.e. *Pycnodactylus*, *Cosmogaster*, *Atactogaster* (=*Nemoxenus*) and *Liocleonus* do not form a homogeneous group, though the first two both have (i) rostrum with converging basal depressions ; (ii) styli of female genitalia transverse. They also resemble *Atactogaster* in having the postmentum shorter than the prementum. *Pycnodactylus*, however, has a greater overall resemblance to *Conorhynchus* and *Ammocleonus* than has *Cosmogaster*. *Liocleonus* also resembles *Conorhynchus* and *Ammocleonus* but is otherwise distinct in having (i)

rostrum with deep median furrow and no carinae and (ii) abdomen uniformly coloured without bare or brown spots. Faust (1904) doubtfully separated his two genera *Nemoxenus* and *Atactogaster* on the ground that the former has shoulders to the elytra. They are here regarded as identical and *Nemoxenus* **syn. n.** thus sinks as a synonym of *Atactogaster*.

8. Type species of six genera are here designated as follows :

Xanthochelus longus Chevrolat, 1873 as type of *Xanthochelus* Chevrolat, 1873 ;

Neocleonus velatus Chevrolat, 1873 (=*Curculio sannio* Herbst, 1795) as type of *Neocleonus* Chevrolat, 1873 ;

Lixus hieroglyphicus Olivier, 1807 as type of *Ammocleonus* Bedel, 1907 ;

Cleonus lateralis Gyllenhal in Schönherr, 1834 as type of *Cosmogaster* Faust, 1904 ;

Neocleonus orientalis Chevrolat, 1873 as type of *Atactogaster* Faust, 1904 ;

Temnorhinus saucerottei Chevrolat, 1873 (=*Bothynoderes brevirostris* Gyllenhal in Schönherr, 1834) as type of *Temnorhinus* Chevrolat, 1873 (=*Conorhynchus* Motschulsky, 1860).

II. HYLOBIINAE

1. REVIEW OF THE LITERATURE

Lacordaire (1863) excluded wingless genera from his tribe " Hylobiides " but he included *Paipalesomus* and placed *Peribleptus* under his " Lixides ". Kôno (1929) described a new genus *Tenguzo*, under Lixini. This was later sunk by Heller (1941) as a synonym of *Peribleptus*, while Marshall (1944) also sank *Paipalesomus* as a synonym of *Peribleptus*.

Faust (1892) described the new genera *Pagiophloeus* and *Dyscerus* under this subfamily ; the latter genus was, however, sunk as a synonym of the former by Heller (1929) but again raised by Marshall (1943) as a valid genus. Kôno (1934) considered both of Faust's genera as synonymous with *Hylobius* Germ. Kôno (1933) also described another genus *Kobuzo* under Hylobiinae.

Blatchley and Leng (1916) defined the Hylobiinae and transferred Sternechini to Cleoninae.

Marshall (1932) made a general survey of the relationships of the subfamily and put forward a provisional classification of the groups which was followed by Dalla Torre (1932). In the same paper he also described an isolated genus *Pinacopus*.

Solari (1941) included Rhytirrhinini, Minyopini and Hyperini as tribes of Hylobiinae in addition to Marshall's tribes (1932). He broadly followed Reitter (1912), but his work only added to the confusion already existing as to the limits of the subfamily since the Hyperini are probably nearer to the Cleoninae in having the metepimeron visible and separating the elytra from the hind coxal cavities (Faust, 1883).

Further uncertainty as to the limits of the subfamily was well demonstrated when Marshall (1948) described two wingless genera *Amphialodes* and *Ypsilepidus* from Burma under the subfamilies Hylobiinae and Cryptorrhynchinae respectively, though their generic separation can hardly be justified. In 1952 he also transferred *Amphialus* Pascoe from *Cryptorrhynchinae* to Hylobiinae and made *Platyrhynchus* Chevrolat a synonym of *Styanax* Pascoe.

Since it is clear that the limits of the subfamily are confused, an attempt is made here to define it more precisely, although it must be emphasized that it is not possible to do so fully on the basis of the Indo-Pakistan genera alone.

2. MATERIAL AND METHODS

The following representatives of the various genera were studied. Type species are marked with an asterisk.

1. *Platyrhynchus* Chevrolat
   **P. bicarinatus* Chevrolat
2. *Styanax* Pascoe
   **S. carbonarius* Pascoe
   Styanax sp. nov.
3. *Peribleptus* Schönherr
   **P. scalptus* Boheman
4. *Paramecops* Schönherr
   **P. farinosus* (Wiedemann)
5. *Kobuzo* Kôno
   **K. rectirostris* (Roelofs)
   K. crassus Marshall
6. *Plinthus* Germar
   **P. megerlei* (Panzer)
   P. findeli (Boheman)
7. *Pagiophloeus* Faust
   P. javanicus Faust
   P. tuberosus Marshall
   P. erosus Marshall
8. *Dyscerus* Faust
   **D. macilentus* (Boheman)
   D. rusticus (Pascoe)
   D. longiclavus Marshall
9. *Hylobius* Germar
   **H. piceus* (Degeer)
   H. angustus Faust
10. *Porohylobius* Faust
   **P. feae* Faust
11. *Euthycus* Pascoe
   **E. macilentus* Pascoe
   E. costalis Marshall
   E. pendleburyi Marshall
12. *Ischnopus* Faust
   **I. taprobanus* Faust
13. *Aclees* Schönherr
   **A. cribratus* Gyllenhal
   A. birmanus Faust
14. *Niphades* Pascoe
   N. pardalotus Pascoe
   N. granicollis Faust
15. *Niphadonyx* Schenkling
   N. ferus (Faust)
16. *Pinacopus* Marshall
   **P. caudatus* Marshall
   P. dentirostris Marshall
   P. mishmensis Marshall
17. *Amphialus* Pascoe
   A. turgidus Pascoe
   A. agrestis Pascoe
18. *Amphialodes* Marshall
   **A. acuminatus* Marshall

The mouth-parts, proventriculus, spermatheca, eighth sternum in the female and female genitalia were stained in acid fuchsin or borax carmine, dehydrated, cleared and mounted in canada balsam.

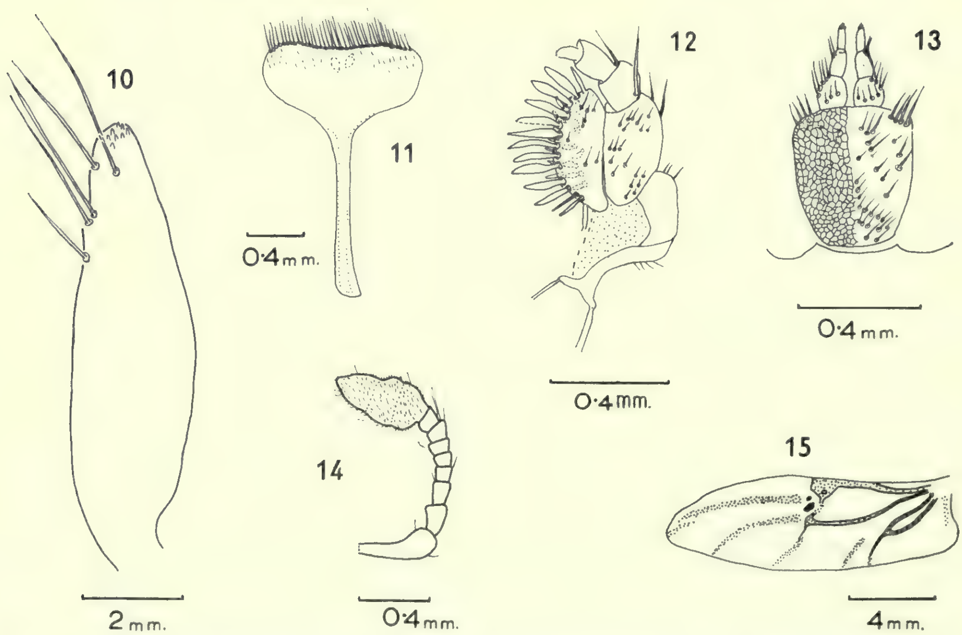
As regards terminology I follow Kuschel (1951) in using the tibial uncus and mucro as equivalent terms. The term " premucro " is used for a tooth present between or near the two inner apical tufts of setae on the tibia. Ting (1936) is followed for the terminology of the labium, i.e. prementum and postmentum in place of mentum and peduncle of other authors. The parts of the proventriculus are given English equivalents of Nüsslin's (1911) terminology.

KEY TO THE GENERA OF HYLOBIINAE

1 (4) Rostrum as long as or shorter than broad. Antennae (fig. 14) very short, not geniculate, scape short, less than $\frac{2}{3}$ the length of the funicle. Maxillae (fig. 12) with lacinial teeth in two planes, i.e. ventral broad teeth on mala also present (but also in *Peribleptus*) ; prementum large and more than twice as long as the short postmentum (fig. 13), very hairy along with the palpi. Free distal part of fifth (apparent fourth) tarsal segment not longer than part enclosed by lobes of third. Hind wing (fig. 15) with vein A4 sclerotized. Proventriculus absent. Eighth sternum (fig. 11) with a fringe of long hairs posteriorly. Female genitalia (fig. 10) without styli.

2 (3) Rostrum transverse, eyes vertically elongate, encroaching on upper and lower surfaces of head. Antennae with seventh segment of funicle free from club ; club large, three-segmented, sutures hardly marked and first segment much shorter than the rest together. Frons narrower than base of rostrum. Metasternum $1\frac{1}{2}$ times longer than the diameter of mid coxae. Top of declivity of elytra not prominent. Free distal part of fifth (apparent fourth) tarsal segment shorter than part enclosed by lobes of third. Fore coxal cavities open in front and prosternum deeply excavate. Vein A2 absent. ***PLATYRHYNCHUS*** Chevrolat

3 (2) Rostrum not transverse, eyes lateral. Antennae with seventh segment of funicle contiguous with club ; club small, compact, apparently four-segmented and first segment almost equal to the rest together. Frons as broad as base of rostrum. Metasternum almost equal to diameter of mid coxae. Elytra with top of declivity prominent. Fore coxal cavities closed anteriorly and prosternum less excavate. Free distal part of fifth (apparent fourth) tarsal segment almost as long as part enclosed by lobes of third. Vein A2 present (fig. 26) . . . . ***STYANAX*** Pascoe



FIGS. 10–15. *Platyrhynchus bicarinatus* : 10, Female genitalia ; 11, Eighth sternum of female ; 12, Maxilla ; 13, Labium ; 14, Antenna ; 15, Wing.

4 (1) Rostrum longer than broad. Antennae (fig. 20) medium or long and geniculate ; scape as long as or slightly longer than the funicle. Maxilla (fig. 18) with lacinial teeth in one plane (except *Peribleptus*) i.e. ventral broad teeth on mala absent ; prementum (if present) usually shorter than, sometimes as long as postmentum (fig. 19) ; palps and prementum never very hairy. Free distal part of fifth (apparent fourth) tarsal segment longer than part enclosed by lobes of third (*above* the third in *Pinacopus*). Hind wing (fig. 17) with vein A4 not sclerotized but represented by a pigmented band only. Proventriculus present. Eighth sternum in female never with a thick fringe of hairs posteriorly though some hairs may be present. Female genitalia (fig. 16) with styli.

5 (6) Rostrum arched in continuation of the head, with two dorsal sulci filled with white secretion. Maxilla (fig. 22) having mala with ventral broad teeth ; palpifer reticulate ; stipes small ; basal segment of palps parallel-sided. Labium (fig. 11) with long notched postmentum visible ventrally and without prementum and palps. Apex of fifth (apparent fourth) tarsal segment with a small tooth under each claw. Elytra projecting over the base of prothorax ; hind wing (fig. 25) with veins A2 and A3 absent. Styli of female genitalia with setae other than the apical ones. Proventriculus (fig. 21) with plate represented by two longitudinally curved reticulate flanges. Body form elongate, like *Lixus* . . . . . . ***PERIBLEPTUS*** Schönherr

6 (5) Rostrum, if arched, not curved continuously with the head ; without two such dorsal sulci. Maxilla (fig. 18) without broad ventral teeth in a second plane (lower row of short broad teeth present in *Niphades* and *Niphadonyx*) ; palpifer not reticulate ; stipes larger ; basal segment of palps never parallel-sided but narrow at base. Labium with pre- and postmentum and three-segmented palps on anterior side of the former. Elytra not projecting over the base of prothorax ; hind wing with A2 and A3 or only A3 present. Fifth (apparent fourth) tarsal segment simple at apex. Styli of female genitalia without setae other than the apical ones. Proventriculus without the flanges if plate present. Body not like *Lixus*.

7 (30) Fore coxae contiguous. Apical mucro of tibia never external, but always shifted to the inner side and arising from a lamella, more or less sharp.

8 (27) Tarsal claws simple. Prosternum not excavate. Eighth sternum (fig. 24) in female with long, simple anterior process. Proventriculus (fig. 27) without plates. Mid and hind tibiae not very broad subapically, their fringes not sinuate ; without a projection at the end of fringes externally.

9 (26) Antennal club neither elongate nor two-segmented. Metepisternum not grooved longitudinally ; metasternum never continuously impressed anteriorly and longitudinally on both sides. Prothorax either broad at basal half or in front of base. Mid and hind tibiae without a subapical fringe parallel to the apical one. Proventriculus with brushes which lack parallel bars supported in the middle posteriorly ; cardiac valve without rows of bristles.

10 (23) Elytra with shoulders. Hind coxae transverse. Mesepimera broad. Metepisternum with head broader than visible posterior part.

11 (16) External fringe of corbel apical and not clearly oblique to the axis of tibia.

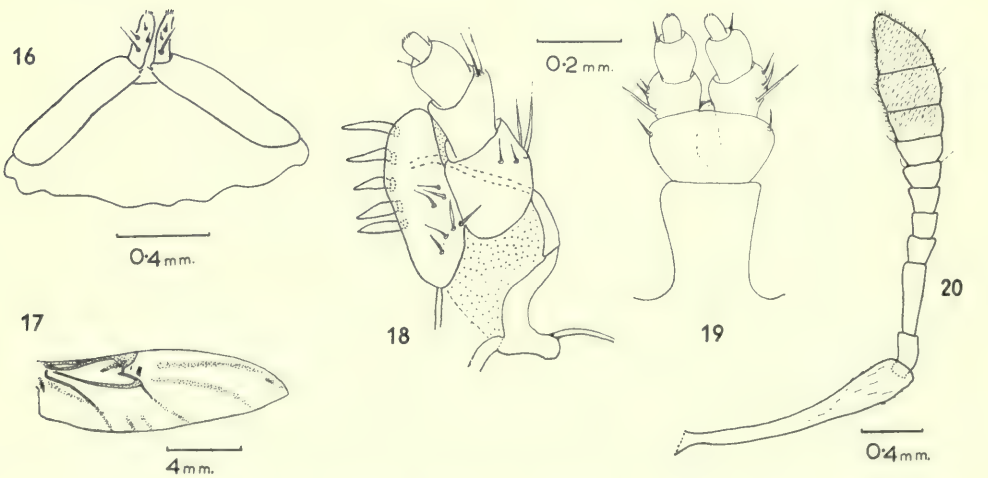
12 (13) Frons narrower than base of rostrum. Rostrum with only a single dorsal apical seta on either side ; scrobes ending laterally at a distance from apex of rostrum ; no lateral seta behind the articulation of mandible. Eyes vertically elongate, encroaching on upper and lower surfaces of head. Prementum slightly longer than broad. Trochanter without an erect seta ; fore tibiae curved externally at base and all without premucro. Wing (fig. 17) with vein M projecting in front of its junction with r–m ; A2 and A3 present. Intercoxal process of third sternum (first visible ventrite) broadly acuminate. Crop with short scattered bristles. Second tarsal segment as long as broad.

PARAMECOPS Schönherr

13 (12) Frons as broad as or slightly broader than base of rostrum. Rostrum with a tuft of dorsal apical setae on each side ; scrobes reaching apex ; lateral seta behind the articulation of mandible present. Eyes lateral in position. Prementum as long as broad or transverse. Trochanters with an erect seta ; fore tibiae not curved externally at base and all tibiae with premucro. Wing (fig. 25) (absent in *Plinthus*) with vein M passing straight into r–m ; A2 absent. Intercoxal process of third sternum broader and not acuminate. Crop with a long and short row of bristles in front of medians and intermedians respectively. Second tarsal segment transverse.

14 (15) Rostrum without median carina ; with lateral longitudinal depression above scrobes and two dorsal furrows. Eyes not acuminate below. Prementum transverse. Seventh funicular segment contiguous with club ; club three-segmented, first segment shorter than the rest together. Prothorax bisinuate at base and rounded at apex above ; pronotum granulate and without carina ; postocular lobes broad. Scutellum distinct. Mesepimeron separated from mesepisternum by a deep broad furrow. Metasternum granulate. Femora abruptly claviform apically. Elytra with alternate intervals not raised and not fused together and with a distinct callosity on top of declivity. Third sternum separated from the fourth by a deep suture. . . ***KOBUZO*** Kôno

15 (14) Rostrum with median carina and without any longitudinal depression or furrows. Eyes acuminate below. Prementum as long as broad. Seventh funicular segment free from club ; club unsegmented (apparently three-segmented), first apparent segment longer than the rest together. Prothorax slightly rounded at base and truncate at apex above ; pronotum carinate medially, not granulate ; postocular lobes absent. Scutellum not visible. Mesepimeron not separated from mesepisternum by a deep broad furrow. Metasternum not granulate. Femora gradually claviform, at least in fore and mid legs. Elytra fused together, their alternate intervals raised, without a distinct callosity at top of declivity which gradually descends to apex. Third sternum separated from fourth by a suture, which is curved and obsolete in the middle. ***PLINTHUS*** Germar



FIGS. 16–20. 16, Female genitalia of *Peribleptus scalptus*. 17, Wing of *Dyscerus clathratus*. 18, Maxilla of *Kobuzo crassus*. 19, Labium of *Kobuzo crassus*. 20, Antenna of *Peribleptus scalptus*.

16 (11) External fringe of corbel oblique. (Frons narrower than base of rostrum (though only slightly so in *Porohylobius*). Prementum transverse and shorter than postmentum.)

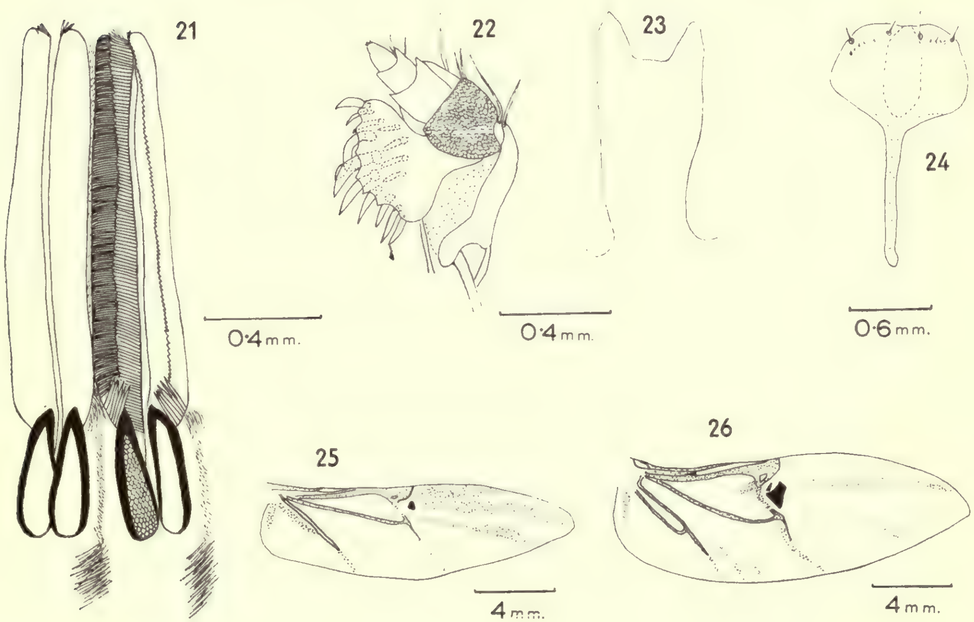
17 (22) Mesepimeron not separated from the mesepisternum by a broad furrow. Premucro absent; hind tibiae not sinuate externally. Elytra with simple scales. Eyes surrounded posteriorly by a depression.

18 (19) Fore tibiae strongly curved at base externally; second segment of hind tarsus transverse. Third sternum separated from the fourth by a deep suture. Two lateral setae behind articulation of each mandible. (Fore tibiae straight externally at apex) . . . . ***PAGIOPHLOEUS*** Faust

19 (18) Fore tibiae straight externally at base. Second segment of hind tarsus not transverse. Third sternum separated from fourth by a weak suture. One seta behind articulation of each mandible.

20 (21) Rostrum with two dorsal furrows. Eyes vertically elongate, encroaching on upper and lower surfaces of head. Seventh funicular segment free from the club. Metasternum transversely impressed behind each mid coxa. Fore tibiae curved externally at apex and with an internal as well as external subapical brush of setae below the apical fringes. Intercoxal process of third sternum acuminate . . . . ***DYSCERUS*** Faust

21 (20) Rostrum without two dorsal furrows. Eyes dorso-lateral. Seventh funicular segment contiguous with the club. Metasternum not transversely impressed behind each mid coxa. Fore tibiae straight externally at apex and without internal or external subapical brush of setae below the apical fringes. Intercoxal process of third sternum broad and arched . . ***HYLOBIUS*** Germar



FIGS. 21–26. *Peribleptus scalptus*: 21, Proventricular blade; 22, Maxilla; 23, Labium. 24, Eighth sternum of female of *Dyscerus clathratus*. Wing of: 25, *Peribleptus scalptus*; 26, *Styanax* sp. n.

22 (17) Mesepimeron separated from mesepisternum by a broad, deep furrow. Premucro present; hind tibiae sinuate externally. Elytra with brush-like scales. Eyes lateral (only very slightly dorsal) and not surrounded posteriorly by a depression . . . . ***POROHYLOBIUS*** Faust

23 (10) Elytra without shoulders. Hind coxae subglobular. Mesepimera very narrow. Metepisternum with its head narrower than its posterior visible part or only visible as a very narrow strip. (Pronotum truncate apically.)

24 (25) Rostrum without marked epistome; with a dorsal longitudinal depression at apex. Eyes not entirely lateral. Prementum shorter than postmentum. Funicle with first segment not longer than second, seventh free from the club; club three-segmented, sutures oblique. Prosternum in front of coxae shorter than their diameter. Scutellum not visible. Trochanters each with at least one long seta. Femora abruptly claviform at apex and toothed. Premucro absent. Third tarsal segment much broader and bilobed. Antero-lateral angles of elytra acute. Intercoxal process of third sternum rounded anteriorly and narrower than a hind coxa. Metepisternum with its head narrower than its posterior visible part. . . . . ***EUTHYCUS*** Pascoe

25 (24) Rostrum with a glabrous epistome; without a dorsal longitudinal depression at apex. Eyes lateral. Prementum longer and broader than postmentum. Funicle with first segment longer than second, seventh contiguous with the club; club really unsegmented but apparently four-segmented because of arrangement of pubescence, apparent sutures transverse. Prosternum in front of coxae longer than their diameter. Scutellum minute. Trochanters without an erect seta. Femora gradually clubbed and untoothed. Premucro small. Tarsi sublinear, third segment very slightly bilobed. Antero-lateral angles of elytra obtuse. Intercoxal process of third sternum truncate and as broad as a hind coxa . . . . ***ISCHNOPUS*** Faust

26 (9) Antennal club elongate, two-segmented, its suture glabrous. Metepisternum grooved longitudinally. Metasternum continuously impressed anteriorly and longitudinally on each side. Prothorax broadest at base. Mid and hind tibiae with a subapical fringe parallel to the apical one. Proventriculus (fig. 29) having brushes with parallel bars supported in the middle posteriorly; cardiac valve with two rows of bristles behind each blade . ***ACLEES*** Schönherr

27 (8) Tarsal claws appendiculate. Prosternum excavate. Eighth sternum in female with anterior process short or long with two arms and sinuate at base. Proventriculus (fig. 28) with grinding plates. Mid and hind tibiae broader subapically and their fringes sinuate; produced into a tooth-like structure at the end of their fringes externally. (Frons as broad as or broader than base of rostrum. Two tufts of setae and two setae between them present at apex of rostrum).

28 (29) Eyes latero-ventral. Club three segmented. Prothorax feebly bisinuate at base. Metasternum distinctly longer than diameter of mid coxae; metepisternum with its head broader than the posterior exposed part. Premucro absent. Elytra jointly sinuate at base and shoulders impressed. Fourth abdominal sternum longer than fifth and sixth together. . . . ***NIPHADES*** Pascoe

29 (28) Eyes lateral and small. Antennal club two-segmented. Prothorax rounded at base. Metasternum shorter than diameter of mid coxae; metepisternum with its head narrower than its posterior part. Premucro present. Elytra truncate at base and without marked shoulders. Fourth abdominal sternum shorter than fifth and sixth together . . . . ***NIPHADONYX*** Dalla Torre

30 (7) Fore coxae separate; apical mucro of tibiae external and without a basal lamella. (Eyes lateral and without posterior depression. Seventh funicular segment free from club. Prothorax truncate at base. Mesepimera fused

with mesepisterna or very narrow. Premucro present. Elytra without marked shoulders.)

31 (32) Prothorax oblique laterally at base ; prosternum very slightly excavated. Tarsi with third segment spatulate (as in Rhynchophorinae) but notched anteriorly. Elytra jointly sinuate at base ; stria 10 abbreviated . ***PINACOPUS*** Marshall

32 (31) Prothorax almost straight laterally at base ; prosternum distinctly excavated. Tarsi with third segment bilobed. Elytra truncate at base ; stria 10 more or less marked.

33 (34) Scutellum small. Metasternum with sutures at least partially defined. Hind coxae subglobular. Tibiae sinuate externally ; external apical fringe sinuate. Intercoxal process of third abdominal sternum subtruncate and broader than a hind coxa ; third abdominal sternum separated from the fourth by a deep transverse suture ; fourth to sixth sterna subequal ***AMPHIALUS*** Pascoe

34 (33) Scutellum not visible. Metasternum with sclerites fused. Hind coxae transverse. Tibiae straight externally ; external apical fringe transverse. Intercoxal process of third abdominal sternum abruptly pointed in the middle and almost as broad as a hind coxa ; third abdominal sternum separated from the fourth by a curved suture, obsolete in the middle ; fourth sternum distinctly longer than fifth and sixth together . . ***AMPHIALODES*** Marshall

4. DEFINITION OF THE SUBFAMILY HYLOBIINAE

Of the Indo-Pakistan genera keyed in the foregoing pages, *Platyrhynchus* Chev., *Styanax* Pasc., *Peribleptus* Schonh., *Pinacopus* Mshl., *Amphialus* Pasc. and *Amphialodes* Mshl. are here removed from this subfamily (see discussion, p. 65). On the basis of the remainder the subfamily Hylobiinae is defined as follows :

Rostrum stout (never narrow like *Pinacopus* Mshl.), broader at apex than at base (except *Aclees birmanus*). Scrobe reaching the apex and its lower margin visible anteriorly, when viewed from above (except *Paramecops* and *Aclees birmanus*). Mala with a single inner row (two rows in *Niphades* and *Niphadonyx*) of stout lacinial teeth but no ventral teeth ; labium with distinct postmentum.

Antenna with club usually shorter than funicle. Fore coxae contiguous ; femora stalked and usually claviform. Tibiae more or less bisinuate internally, at least the fore ones, and compressed; sharp mucro never external but somewhat shifted to the inner side and arising from a more or less distinct lamella and oblique to the axis of the tibia (almost at right angle in *Kobuzo*) ; claws simple (appendiculate in *Niphades* and *Niphadonyx*).

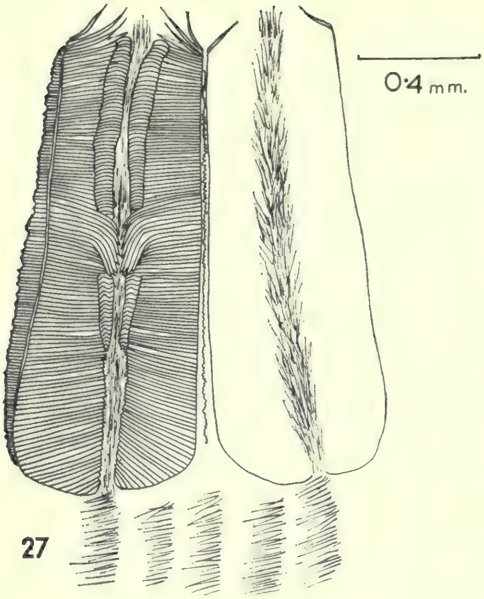
Elytra broader than base of prothorax (except *Euthycus*). Wings folded proximal to the middle; at least A3, A4 and A5 present ; A4 sclerotized, A3 and A5 represented by pigmented bands only.

Spermathecal gland always vesiculate ; stylus of female genitalia without setae except at apex.

5. DISCUSSION

The Indo-Pakistan Hylobiinae, as defined by Marshall (1932) and with the same arrangement followed in Catalogus Coleopterorum (Dalla Torre, *et al.*, 1932), are a heterogeneous assemblage of genera. It is therefore proposed to comment first on the tribes included by Marshall (1932). Type species of almost all the genera studied are represented in the British Museum (Natural History).

The tribe Paipalesomini, represented in Indo-Pakistan by *Peribleptus*, is peculiar in having (i) *Lixus*-like shape, (ii) prementum absent, (iii) mucro on tibiae external and (iv) proventriculus with characteristic flanges of grinding plate. The last three



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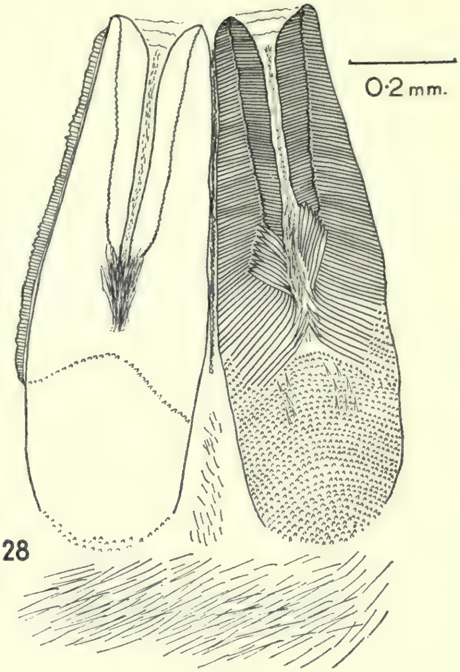

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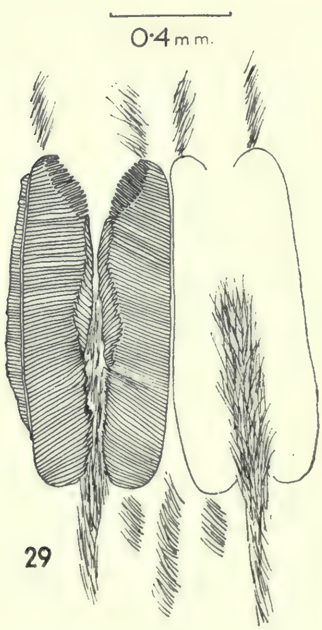

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FIGS. 27–29. Proventricular blade of: 27, *Euthycus costalis*; 28, *Niphadonyx ferus*; 29, *Aclees cribratus*.

characters more or less agree with those of some Rhynchophorinae (*Cosmopolites*). This tribe is here removed from Hylobiinae and raised to subfamily rank.

The tribe Hylobiini has been separated by Marshall from the tribe Liparini solely on the basis of the presence or absence of humeral calli and functional wings. Despite this, the wingless genus *Porohylobius* is included in the Catalogue under subtribe Hylobiina. Similarly the wingless genus *Niphadonyx* has been placed under Liparini far from an undoubtedly close genus *Niphades* (Lithinini).

The tribe Anchonini, moreover, is a heterogeneous assemblage. *Ischnopus* is nearer to *Euthycus* (placed under Liparini) than to any of the other Anchonini. This tribe is distinct from other Hylobiinae and is here raised to subfamily rank.

The Lithinini contains some genera without a proventriculus (i.e. *Lithinus*, *Styanax* and *Platyrhynchus*), while *Niphades* and others have a well developed proventriculus. It is suggested that this group should be limited to genera without a proventriculus and be raised to subfamily rank. A more precise definition must await further study.

Furthermore, *Sternechus* resembles *Gonipterus* (Gonipterinae) more closely than any Hylobiinae and should form a separate subfamily (Sternechinae).

As the limits of the tribes mentioned by Marshall (1932) are so ill-defined I have preferred to construct a key to genera without division into tribes.

Below an attempt is made to indicate some generic relationships among Indo-Pakistan Hylobiinae. Other genera are also discussed briefly.

1. *Hylobius*, *Pagiophloeus*, *Dyscerus* and *Porohylobius* form a group which have (i) external fringe of corbel oblique, (ii) frons narrower than base of rostrum, (iii) elytra with shoulders, (iv) mesepimeron broad, (v) antennal club never two-segmented. *Porohylobius* species are wingless with mesepimeron separated from mesepisternum by a deep furrow and elytra with brush-like scales. It is less closely related to *Pagiophloeus* than the other two.

2. A second group comprises the genera *Paramecops*, *Kobuzo* and *Plinthus*, all having the fringe of the corbels apical. The first two genera show more affinities to the *Hylobius*-group than does the last one, while *Kobuzo* comes nearer to *Porohylobius* than does *Paramecops*. *Plinthus* does not closely resemble any other Hylobiinae.

3. *Euthycus* and *Ischnopus* are closely allied genera of wingless species.

4. *Niphades* and *Niphadonyx* form another distinctive group having (i) claws appendiculate, (ii) proventriculus with grinding plates resembling Cossoninae and Scolytinae and (iii) prosternum more or less excavate. *Niphades* shows a greater resemblance to the *Hylobius*-group than does *Niphadonyx*.

5. *Aclees* is a very distinct genus with a two-segmented elongate antennal club. It most closely resembles the *Hylobius*-group (except for *Hylobius*).

6. *Pinacopus*, *Amphialus* and *Amphialodes* (= *Ypsilepidus* Mshl., **syn. n.**) are transferred to the Cryptorrhynchinae.

7. *Platyrhynchus* Chev. is a valid genus, not a synonym of *Styanax* ; both should be included in the tribe Lithinini, which is here raised to subfamily rank.

8. *Peribleptus* Schönh. is removed from Hylobiinae on the basis of its shape, mouth parts, tibial mucro and proventriculus.

9. *Niphades pardalotus* Pascoe and *Amphialus turgidus* Pascoe are here designated as type species of *Niphades* Pascoe and *Amphialus* Pascoe respectively.

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A SYNONYMIC LIST OF THE GENUS *NACADUBA* AND ALLIED GENERA (LEPIDOPTERA: LYCAENIDAE)

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Pp. 67–116 ; *Plates* 1–2 ; 91 *Text-figures*

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A SYNONYMIC LIST OF THE GENUS *NACADUBA* AND ALLIED GENERA (LEPIDOPTERA: LYCAENIDAE)

By G. E. TITE

CONTENTS

SYNOPSIS

The species of *Nacaduba* are listed according to their relationships. In particular the grouping of species and subspecies from the Papuan region, hitherto confused, has been corrected, as the result of examination of the type specimens described by Lord Rothschild, Fruhstorfer, and others. Ten new species and nineteen new subspecies are described.

INTRODUCTION

THE Indo-Malayan representatives of *Nacaduba* have been ably dealt with by Toxopeus, Corbet, and Eliot, so that probably little remains to be discovered about the specific relationships of the races from that region. Study of the material in the British Museum (Natural History), however, reveals a very different situation as regards the more eastern portion of the Indo-Australian region, especially in respect of that from New Guinea, the Bismarck Archipelago, and the Solomon Islands. Investigation of the types shows that most of the insects described as species by the late Lord Rothschild have by various authors been assigned as subspecies to quite unrelated species ; this, and the discovery of a number of species new to science, renders the present work desirable. The presence in the B.M. (N.H.) of most of Fruhstorfer's types has facilitated the correct specific grouping of the races he described. Toxopeus has shown (1929) that the genus *Nacaduba* can be conveniently divided into smaller units, and has given these units generic rank ; with some modifications this system is followed here, consideration being given to the male genitalic structures and to the slight differences in venation. Dr. Corbet (1938) deprecates the division of *Nacaduba* and gives as one reason the fact that the females of the *berenice* and *nora* groups cannot be separated on differences of vena-

tion. This does not seem to be a conclusive argument, and could be carried to extreme lengths, as was done by Aurivillius when he incorporated into the single genus *Cupido* twenty-four groups, to each of which generic status is generally accorded by other competent systematists. The extent of the anastomosis of veins 11 and 12 of the fore wing has been used by various authors as a generic character ; this is not always reliable, as it can vary considerably in individuals of the same species. During the course of the present work, the following species have been observed to vary in this way : *N. beroe*, *N. hermus*, *N. pactolus* and *N. sinhala*.

It is intended that this paper should be used in conjunction with the works of the authors mentioned above ; it does not aspire to the status of a monograph. Future investigation may prove that some of the listed subspecific names are not well founded, and may become synonyms. Herein, the main consideration has been to group all the published names in correct relation to the species, and the fact that a name is included does not necessarily imply approval of its validity or status. Whenever possible, figures of the male genitalia are given for those species that are not so figured elsewhere. The word (Type !) after a reference indicates that the type is in the B.M. (N.H.) and that it has been examined.

The author wishes to express thanks to Colonel J. N. Eliot who has presented specimens (including types) to the B.M. (N.H.), lent others from his collection, and aided the completion of the work by helpful criticism and suggestions.

NACADUBA Moore

Nacaduba Moore, 1881 : 88.

Type species : *Lampides prominens* Moore.

The genus in its present restricted sense forms a reasonably homogeneous group ; although certain species exhibit characters that would seem to split the genus into even smaller sections or subgenera, the great difference in the formation of the penis in the *beroe*, *calauria* and *astarte* groups being a case in point.

Nacaduba sericina (Felder)

(i) *N. sericina sericina* (Felder)

(Text-figs. 12 and 43)

Lycaena sericina Felder, 1865 : 277, pl. 34, figs. 30 and 31, Luzon (Type !).
Nacaduba smaragdina Semper, 1890 : 178, pl. 33, fig. 4, Mittel-Luzon.

(ii) *N. sericina thaumus* Fruhstorfer

Nacaduba sericina thaumus Fruhstorfer, 1916 : 111, Bazilan and Mindanao.

Nacaduba angusta (Druce)

(i) *N. angusta kerriana* Distant

Nacaduba kerriana Distant, 1886 : 253, Singapore.

(ii) *N. angusta albida* Riley & Godfrey

Nacaduba angusta f. albida Riley & Godfrey, 1925 : 141, pl. 3, fig. 2, Siam (Type !).

(iii) *N. angusta honorifice* Fruhstorfer

Nacaduba angusta honorifice Fruhstorfer, 1916 : 42, Nias.

(iv) *N. angusta flumena* Fruhstorfer

Nacaduba angusta flumena Fruhstorfer, 1916 : 112, W. Java.

(v) *N. angusta angusta* (Druce)

Cupido angusta Druce, 1873 : 349, pl. 32, fig. 9, Borneo (Type !).

(vi) *N. angusta thespia* Fruhstorfer

Nacaduba angusta thespia Fruhstorfer, 1916 : 112, Banguey (Type !).

(vii) *N. angusta limbura* Fruhstorfer

Nacaduba angusta limbura Fruhstorfer, 1916 : 112, S. Philippines.

(viii) *N. angusta sangira* Fruhstorfer

Nacaduba angusta sangira Fruhstorfer, 1916 : 112, Sangir.

(ix) *N. angusta azureus* (Röber)

Plebeius azureus Röber, 1886 : 63, pl. 4, fig. 19, E. Celebes.

(x) *N. angusta pamela* Grose-Smith

Nacaduba pamela Grose-Smith, 1895 : 508, S. Celebes (Type !).
Nacaduba atromarginata Druce, 1902 : 113, pl. ii, figs. 1 and 2, S. Celebes (Type !).

Nacaduba pactolus (Felder)

(i) *N. pactolus ceylonica* Fruhstorfer

Nacaduba pactolus ceylonica Fruhstorfer, 1916 : 114, Ceylon.

(ii) *N. pactolus continentalis* Fruhstorfer

Nacaduba pactolus continentalis Fruhstorfer, 1916 : 114, Sikkim.

(iii) *N. pactolus hainani* Bethune-Baker

Nacaduba hainani Bethune-Baker, 1914 : 125, Formosa.

(iv) *N. pactolus andamanica* Fruhstorfer

Nacaduba pactolus andamanica Fruhstorfer, 1916 : 114, Andamans (Type !).

(v) *N. pactolus macrophthalma* (Felder)

Lycaena macrophthalma Felder, 1862 : 483, Pulu Mihu.
Nacaduba vajuva varia Evans, 1932 : 241, S. Nicobars (Type !).

(vi) *N. pactolus odon* Fruhstorfer

Nacaduba pactolus odon Fruhstorfer, 1916 : 114, Macromalayana (Type !).

(vii) *N. pactolus lycoreia* Fruhstorfer

Nacaduba pactolus lycoreia Fruhstorfer, 1916 : 115, Java and Micromalayana (Type !).

(viii) *N. pactolus cyaniris* (Röber) **comb. n.**

Plebeius cyaniris Röber, 1891 : 315, 1892, pl. 5, fig. 4, Flores.

(ix) *N. pactolus neaira* Fruhstorfer

Nacaduba pactolus neaira Fruhstorfer, 1916 : 114, Philippines.

(x) *N. pactolus pactolides* Fruhstorfer

Nacaduba pactolus pactolides Fruhstorfer, 1916 : 115, Celebes & Bangaai.

(xi) *N. pactolus pactolus* (Felder)

Lycaena pactolus Felder, 1860 : 456, Amboina (Type !)

(xii) *N. pactolus cela* Waterhouse & Lyell

Nacaduba pactolus cela Waterhouse & Lyell, 1914 : 94, figs. 850 and 851, Darnley Island.

(xiii) *N. pactolus waigeuensis* (Joicey & Talbot)

Lampides pactolus waigeuensis Joicey & Talbot, 1917 : 221, Waigeu (Type !).

(xiv) *N. pactolus antalcidas* Fruhstorfer

Nacaduba pactolus antalcidas Fruhstorfer, 1915 : 146, Central Dutch New Guinea.

(xv) *N. pactolus raluana* Ribbe

Nacaduba (*Lampides*) *pactolus raluana* Ribbe, 1899 : 231, Neu Pommern, Neu Lauenburg.

Nacaduba pavana (Horsfield)

(Text-fig. 4)

(i) *N. pavana singapura* Corbet

Nacaduba pavana singapura Corbet, 1938 : 134, pl. 1, figs. 24 and 30, Malay Pen. (Type !).

(ii) *N. pavana vajuva* Fruhstorfer

Nacaduba pavana vajuva Fruhstorfer, 1916 : 108, Siam (Type !).

(iii) *N. pavana pavana* (Horsfield)

Lycaena pavana Horsfield, 1828 : 77, Java (Type !).

(iv) *N. pavana georgi* Fruhstorfer

Nacaduba pavana georgi Fruhstorfer, 1916 : 111, Ost-Mindanao.

(v) *N. pavana visuna* Fruhstorfer

Nacaduba pavana visuna Fruhstorfer, 1916 : 110, Celebes (Type !).

Nacaduba russelli **sp. n.**

(Text-figs. 1–3)

Superficially, in both sexes, this recently discovered species is very like *N. pavana singapura*, and in the description that follows, all comparisons are made with that insect. The male was brought to notice by Colonel J. N. Eliot and its captor Major A. Bedford Russell. A search in the B.M. (N.H.) has produced two specimens which, from external characters, are almost certainly females of the species.

The male upperside is purple with a slight gloss in certain lights, altogether more opaque, and with a much wider blackish margin on all wings. In the female, the blue basal areas of all wings are blue-lavender with a shining blue gloss by refraction ; this is in distinct contrast to the pale grey-green blue of female *singapura*. In both sexes beneath, as in *singapura*, there are no basal markings on the fore wing, and the banding consists of two parallel dark lines with a much lighter area between them. The tornal black spot on the hind wing is large ; its enclosing orange lunule is deeper in colour and more extensive, spreading over veins 2 and 3 and well into the adjoining areas. The submarginal spots are lozenge shaped, whereas, those of *singapura* are dash-like, and are surrounded by a much wider white area, giving the wing margins of that species a much neater appearance. Verification of the identity of the male is furnished by the unique formation of the clasper ; this is of the same general shape as that of *N. kurava*, but the simple turned over apical portion, to be seen in that species, is replaced by a broad spatulate structure, heavily armed with some seven or eight inwardly directed quill-like points of varying lengths. A few scattered smaller points are present around the bases of the larger ones, especially at the extreme apex.

Holotype ♂, Malaya : Upper Gombak River, Ulu Gombak, 14.vi.1959 (*Major A. Bedford Russell*). B.M. Type No. Rh. 16616.

Allotype ♀, Singapore : Nee Soon, 22.xii.1938 (*J. N. Eliot*). B.M. Type No. Rh. 16617.

Paratypes. As holotype, 28.vi.1959, 1 ♂ ; Malaya : Penang Hill (*Adams*), 1 ♀.

Nacaduba hermus (Felder)

(i) *N. hermus sidoma* Fruhstorfer

Nacaduba pavana nabo f. sidoma Fruhstorfer, 1916 : 108, S. India (Type !).

(ii) *N. hermus nabo* Fruhstorfer

Nacaduba pavana nabo Fruhstorfer, 1916 : 108, Assam (Type !).

(iii) *N. hermus vicania* Corbet

Nacaduba hermus major Evans, 1932 : 240, S. Nicobars (Type !), (nom. preocc. by *N. berenice major* Rothschild, 1915 : 139).
Nacaduba hermus vicania Corbet, 1938 : 133, Nicobars (Type !).

(iv) *N. hermus swatipa* Corbet

Nacaduba hermus swatipa Corbet, 1938 : 132, pl. 1, figs. 27 and 35, Malay Pen. (Type !).

(v) *N. hermus valvidens* Toxopeus

Nacaduba nabo valvidens Toxopeus, 1929 : 233, W. Java.

(vi) *N. hermus minja* Fruhstorfer

Nacaduba pavana minja Fruhstorfer, 1916 : 109, Lombok (Type !).

(vii) *N. hermus tairea* Fruhstorfer

Nacaduba pavana tairea Fruhstorfer, 1916 : 110, Philippines (Type !).

(viii) *N. hermus hermus* (Felder)

Lycaena hermus Felder, 1860 : 457, Amboina (Type !).

Nacaduba subperusia (Snellen)

(i) *N. subperusia lysa* Fruhstorfer

Nacaduba pavana lysa Fruhstorfer, 1916 : 109, Sumatra (Type !).
Nacaduba intricata Corbet, 1938 : 131, pl. 1, fig. 28, Malay Pen. (Type !), ♂ nec. ♀. **syn. n.**

(ii) *N. subperusia nadia* Eliot

Nacaduba subperusia nadia Eliot, 1955 : 155, Nicobar Is. (Type !).

(iii) *N. subperusia subperusia* (Snellen)

Lycaena subperusia Snellen, 1896 : 93, Java.

(iv) *N. subperusia paska* Eliot

Nacaduba subperusia paska Eliot, 1955 : 156, Sula Besi (Type !).

(v) *N. subperusia martha* Eliot

Nacaduba subperusia martha Eliot, 1955 : 156, New Guinea (Type !).

Nacaduba sanaya Fruhstorfer

(i) *N. sanaya elioti* Corbet

Nacaduba sanaya elioti Corbet, 1938 : 133, pl. 1, figs. 25 and 32, Malay Pen. (Type !).
Nacaduba sanaya thalia Corbet, 1938 : 134, Borneo (Type !).
Nacaduba sanaya elioti (= *thalia* Corbet), Eliot, 1955 : 157.

(ii) *N. sanaya sanaya* Fruhstorfer

Nacaduba pavana sanaya Fruhstorfer, 1916 : 109, Nias (Type !).

(iii) *N. sanaya naevia* Toxopeus

Nacaduba sanaya naevia Toxopeus, 1929 : 232, W. Java.

(iv) *N. sanaya metallica* Fruhstorfer

Nacaduba pavana metallica Fruhstorfer, 1916 : 110, Celebes (Type !).

Nacaduba ollyetti Corbet

Nacaduba ollyetti Corbet, 1947 : 1, Ceylon (Type !).

Nacaduba asaga Fruhstorfer

(Text-fig. 7)

Nacaduba pavana asaga Fruhstorfer, 1916 : 109, Borneo (Type !).

N. asaga has hitherto been treated as conspecific with *N. pendleburyi*, and *N. solta* ; from both it is at once distinguished by the more obtuse apex of the fore wing, and by the steel-grey tone of the purple colour on the male upperside ; it is without the wide dark marginal band of *pendleburyi*. The genitalia are very similar to those of the two species mentioned above, but the clasper has a markedly concave dorsal edge.

Material in B.M. (N.H.). BORNEO : Sintang (*Dr. Martin*), 1 ♂ (holotype) ; Lawas (*A. Everett*), 2 ♂.

Nacaduba pendleburyi Corbet

In all races, the male is purple-blue above, and the fore wing is margined with black. The dorsal edge of the clasper is only slightly concave, and the turned over portion of the apex is short and blunt.

(i) *N. pendleburyi pendleburyi* Corbet **stat. n.**

(Text-figs. 5 and 8)

Nacaduba asaga pendleburyi, Corbet, 1938 : 129, pl. 1, figs. 26 and 29, Pahang : Fraser's Hill (Type !).

Material in B.M. (N.H.). MALAYA : Pahang, Fraser's Hill, 6 ♂, 1 ♀ (including holotype and allotype) ; Selangor, Bukit Kutu, 1 ♂, 1 ♀ ; Johore, Lombong, 1 ♂, Singapore, 1 ♀ ; Malacca, 1 ♀. In Col. Eliot's Collection. MALAYA : Pahang, Fraser's Hill, 3 ♂ ; Johore, Panti, 1 ♂ ; Singapore, 1 ♀.

(ii) *N. pendleburyi penangensis* **ssp. n.**

(Text-fig. 6)

On the upperside, the male can be distinguished from the preceding race by the much heavier dark costal and distal margins of the fore wing ; on the hind wing above, by the presence of a complete series of submarginal spots and lunules. The female does not differ above from that sex of the nominate race, but is recognizable beneath by the position of the median striae, which are placed much nearer to the distal margin in both sexes.

Holotype ♂, MALAYA : Penang Hill (*M. J. V. Miller*), B.M. Type No. Rh. 16562.

Allotype ♀, as holotype, B.M. Type No. Rh. 16563.

Other material. As holotype 8 ♂ ; Penang (*Evans*), 1 ♂.

(ii) *N. pendleburyi latemarginata* **ssp. n.**

The fore wing is broadly margined above like that of *penangensis*, but the hind wing is entirely without the submarginal markings so evident in that subspecies, even the tornal spot in cellule 2 is only rendered visible by transparency from the under surface. The median double band of white striae on the fore wing beneath is placed as in *penangensis*.

Holotype ♂, RHIO ARCHIPELAGO: Karimon Is., xii.1937 (*J. N. Eliot*), B.M. Type No. Rh. 16564.

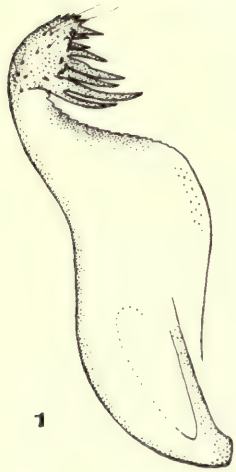
Paratypes (in Col. Eliot's Collection). Same data, 3 ♂.

Nacaduba solta Eliot **stat. n.**

(Text-fig. 9)

Nacaduba intricata Corbet, 1938 : 131, pl. 1, fig. 34, Pahang (Type !), ♀ nec. ♂, **syn. n.**
Nacaduba asaga solta Eliot, 1955 : 157, Sumatra (Type !).
Nacaduba pendleburyi (c) Eliot, 1955 : 157, Malaya.

The male differs from that of *pendleburyi* by the bronze tinge of the purple ground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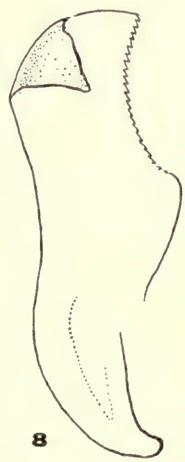
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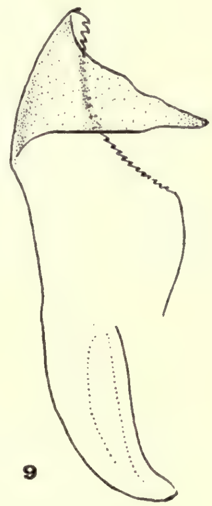
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FIGS. 1–3. *Nacaduba russelli*: 1, clasper; 2, aedeagus; 3, portion of hind wing.
FIG. 4. *N. pavana*: portion of hind wing.
FIGS. 5–6. *Nacaduba pendleburyi* upperside; 5, ♂ *pendleburyi*; 6, ♂ *penangensis*.
FIGS. 7–9. ♂ clasper: 7, *Nacaduba asaga*; 8, *N. pendleburyi pendleburyi*; 9, *N. solta*.

colour, and by the linear black margins on all wings. Below, both sexes differ by the much straighter upper portion of the median band on the fore wing. The turned-over apex of the male clasper is much longer and more pointed than is that of either of the allied species.

Col. Eliot has made the interesting discovery that whereas both *asaga* and *pendleburyi* males are furnished with androconial scales, no such structures can be found in the males of *N. solta*, even in really fresh specimens.

Material in B.M. (N.H.). SUMATRA: Siboga, ii.1903, 3 ♂ (including holotype); Sumatra (Hewitson Coll.), 1 ♀. MALAYA: Pahang, iii.1921 (*Evans*), 1 ♀ (allotype of *intricata* Corbet); Pahang, Raub, 18.v.1937 (*J. N. Eliot*), 1 ♂; Perak, Kedah, xii.1915, 1 ♀; Selangor, Bukit Kutu, 17.vi.1931 (*D. M. Pendlebury*), 1 ♀. B. N. BORNEO: Mt. Marapok (*Adams Coll.*), 2 ♂.

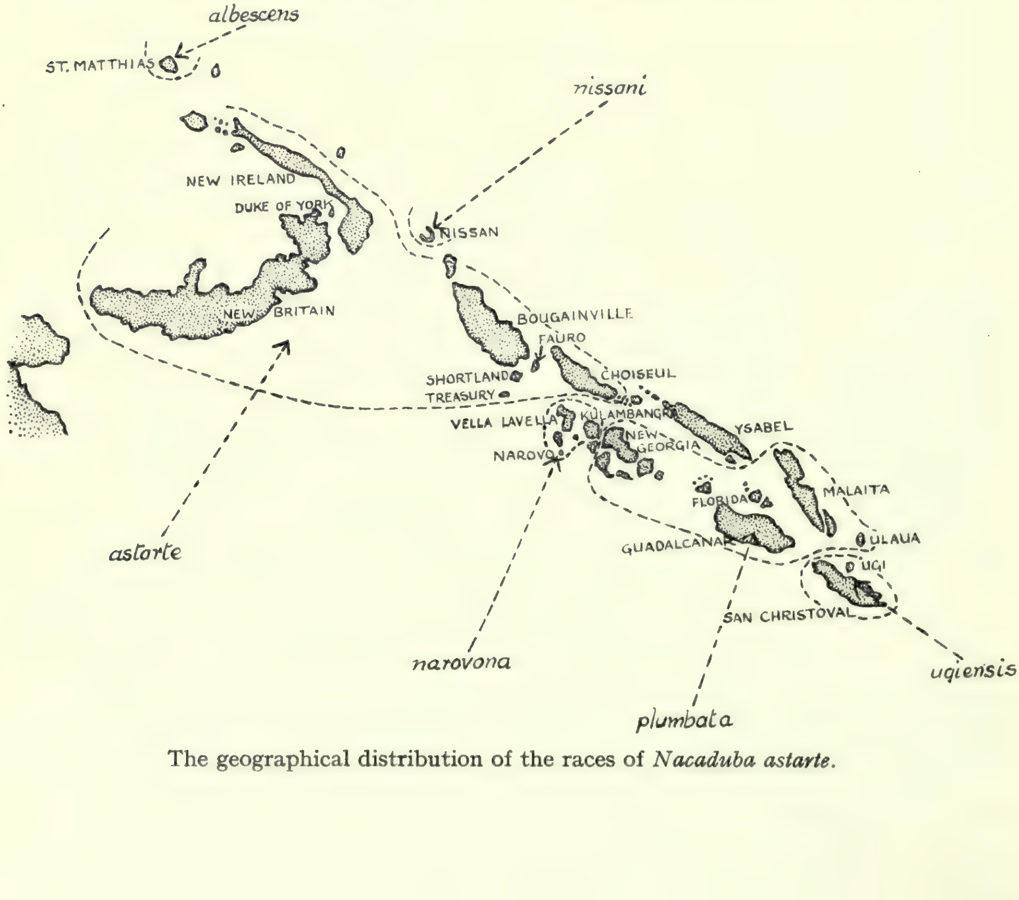
Nacaduba astarte (Butler)

(see map)

(i) *N. astarte astarte* (Butler)

Lampides astarte Butler, 1882: 150, New Britain (Type !).
Nacaduba astarte Druce, 1891: 359, pl. 32, fig. 10, Solomons.

This race is represented in the B.M. (N.H.) by examples from New Britain, New Ireland, Duke of York I., Bougainville, Alu, Tugela, Choiseul, and Fauro.



The geographical distribution of the races of *Nacaduba astarte*.

(ii) *N. astarte albescens* **ssp. n.**

The male differs above from the nominate race by its lighter colour ; it is also smaller, having a fore wing length of only 11–12 mm. The female is altogether brighter, the blue area of the fore wing being shining sky-blue. On the hind wing, the tint is similar, but rather obscured by blackish scaling ; the whitish band between the blue area and the submarginal lunules—though individually variable in width—is always whiter and more prominent. All five examples exhibit a dusky dual spot in areas 4 and 5, just beyond the end of the hind wing cell ; this evidently represents the " oblong blackish spot " mentioned by Butler in his description of *astarte*. On the underside in both sexes, the basal and median markings are of a decidedly greyish tone, the edges of the median band being sharply outlined with blackish ; the inner edge in turn being bordered with white. Beyond the band, the wing is clear white, only broken by the sharply delineated black submarginal crescents and spots, and by the marginal line.

Holotype ♂, BISMARCK ARCHIPELAGO : St. Matthias I. (1° 40′ S., 149° 40′ E.), vii.1923 (*A. F. Eichhorn*), B.M. Type No. Rh. 16565.

Allotype ♀, as holotype, vi.1923, B.M. Type No. Rh. 16566.

Other material. As allotype, 1 ♂, 4 ♀.

(iii) *N. astarte nissani* **ssp. n.**

Closely allied to the preceding race—both sexes on both surfaces showing considerable resemblance to it—but distinguishable in the following characters : the male is larger, and does not differ from that sex of the nominate subspecies. In the female, the sky-blue areas are somewhat clouded by dark scaling, and the dusky margins of the fore wing are so reduced that the submarginal series of lunules and spots is clearly visible. Beneath, the ground colour is earth-brown, of a lighter tint than that of *a. astarte* ; on the fore wings, the submarginal lunules appear as a series of isolated crescents on a white ground, and the lower portion of the median band on the hind wings is less sinuous.

Holotype ♂, SOLOMON ISLANDS : Nissan I. (4° 30′ S., 154° 20′ E.), viii–ix.1924 (*A. F. Eichhorn*), B.M. Type No. Rh. 16567.

Allotype ♀, same data, B. M. Type No. Rh. 16568.

Other material. Same data, 3 ♂, 5 ♀.

(iv) *N. astarte plumbata* Druce **stat. n.**

(Text-fig. 10)

Nacaduba plumbata Druce, 1891 : 359, pl. 31, figs. 3–4.

Examples from Guadalcanar, Malaita and Ulaua show no indication on the underside of the white area beyond the median band, so characteristic of the races so far dealt with ; a series from Florida I. and Tulagi exhibits a range of forms that are, however, transitional in this respect.

(v) *N. astarte narovona* Grose Smith **stat. n.**

Nacaduba narovona Grose Smith, 1897 : 518, Narovo (Type !).

As this insect is of restricted habitat, and the male genitalia offer no distinctive characters, it is best treated as a subspecies of *astarte*. It can be recognized on the underside by the regular curved median band on the fore wing, and by the angled but not sinuous median band on the hind wing. Besides the type locality, the subspecies is represented in the B.M. (N.H.), by females only, from the neighbouring islands of Vella Lavella, Guizo and Kulambranga.

Nacaduba ugiensis Druce

Nacaduba ugiensis Druce, 1891 : 360, pl. 31, fig. 5, Ugi (Type !).

Only known in the female, the true affinities of the insect can only be ascertained when examples of the other sex become available. It may possibly prove to be the representative of *astarte* on Ugi and San Christobal.

Nacaduba berenice (Herrich-Schaeffer)

(i) *N. berenice ormistoni* Toxopeus

Nacaduba berenice ormistoni Toxopeus, 1927 : 434, Ceylon.

(ii) *N. berenice plumbeomicans* (Wood-Mason & de Niceville)

Lampides plumbeomicans Wood-Mason & de Niceville, 1880 : 231, Andamans.

(iii) *N. berenice nicobaricus* (Wood-Mason & de Niceville)

Lampides plumbeomicans nicobaricus Wood-Mason & de Niceville, 1881 : 234, Katschal I.

(iv) *N. berenice aphya* Fruhstorfer

Nacaduba berenice aphya Fruhstorfer, 1916 : 127, Siam (Type !).

(v) *N. berenice icena* Fruhstorfer

Nacaduba berenice icena Fruhstorfer, 1916 : 127, Macromalayana (Type !).

(vi) *N. berenice aphana* Fruhstorfer

Nacaduba berenice aphana Fruhstorfer, 1916 : 127, Nias (Type !).

(vii) *N. berenice rapara* Fruhstorfer

Nacaduba berenice rapara Fruhstorfer, 1916 : 128, Bawean.

(viii) *N. berenice zyrthis* Fruhstorfer

Nacaduba berenice zyrthis Fruhstorfer, 1916 : 128, Flores, Sumba, and Tana Djampea.

(ix) *N. berenice akaba* (Druce) **comb. n.**

Cupido akaba Druce, 1873 : 350, Borneo (Type !).

(x) *N. berenice zygida* Fruhstorfer

Nacaduba berenice zygida Fruhstorfer, 1916 : 128, Philippines (Type !).

(xi) *N. berenice maputi* (Semper) **comb. n.**

Chilades maputi Semper, 1889 : 170, pl. 32, fig. 26, E. Mindanao.

(xii) *N. berenice eliana* Fruhstorfer

Nacaduba berenice eliana Fruhstorfer, 1916 : 128, Celebes (Type !).

(xiii) *N. berenice carnania* Fruhstorfer

Nacaduba berenice carnania Fruhstorfer, 1916 : 129, Obi (Type !).

(xiv) *N. berenice illuensis* (Röber)

Plebeius illuensis Röber, 1886 : 64, pl. 4, figs. 30–31, Ceram and Aru.

(xv) *N. berenice dobbensis* (Röber)

Plebeius dobbensis Röber, 1886 : 65, pl. 4, fig. 34 ; pl. 5, fig. 19, Aru.

(xvi) *N. berenice apira* Fruhstorfer

Nacaduba berenice apira Fruhstorfer, 1916 : 129, Bismarcks.

(xvii) *N. berenice korene* Druce

Nacaduba korene Druce, 1891 : 361, pl. 31, fig. 8, Aola, Guadalcanar (Type !).

(xviii) *N. berenice berenice* (Herrich-Schaeffer)

Lycaena berenice Herrich-Schaeffer, 1869 : 74, Rockhampton.

Nacaduba sinhala Ormiston

Nacaduba berenice ceylonica Fruhstorfer 1916 : 127, Ceylon (nom preocc. by *N. pactolus ceylonica* Fruhstorfer, 1916).
Nacaduba sinhala Ormiston, 1924 : 53 and addenda, Ceylon.

Nacaduba cajetani **nom. n.**

(Pl. 1, fig. 9. Text-figs. 13 and 36)

Nacaduba felderi Rothschild, 1915 : 139, Centr. Ceram (Type !).
Prosotas felderi (Rothschild) Toxopeus, 1930 : 100, nec. *Prosotas felderi* (Murray) Toxopeus, 1930 : 100.
Prosotas parrhasius rothschildi Toxopeus, 1930 : 100, nec. *Nacaduba kurava rothschildi* Toxopeus, 1927 : 430.

Toxopeus substituted the name *rothschildi* for *N. felderi* Rothschild on the grounds that the latter was a homonym of *Lycaena felderi* Murray ; he quite wrongly supposed *felderi* Rothschild to be the Buru and Ceram race of *Prosotas nora* Felder, which species he called *Prosotas parrhasius* (Fabricius). An elucidation of this problem was obtained from the permanent staff of the International Commission of Zoological Nomenclature, and the above synonymy has been compiled in accordance with this.

The species can be recognized by the presence of a yellow lunule in each of cellules 1, 2 and 3, of the hind wing beneath, a state of affairs not found in any other species in the genus. Genitalically it is very closely allied to *berenice*, but the clasper is shorter and stouter, with fewer but larger teeth on the distal margin. In the B.M. (N.H.) it is represented by specimens from Dutch New Guinea, the islands in Geelvink Bay, Obi, Batchian, Amboina and Ceram.

Nacaduba novaehebridensis Druce

(i) *N. novaehebridensis novaehebridensis* Druce **stat. n.**

Nacaduba novaehebridensis Druce, 1892 : 438, pl. 27, figs. 7 and 8, Pentecost I. (Type !).

In this and the other two races here discussed, the spots composing the median band on the fore wing underside diminish in size from the hind margin to the costa, whereas those of *berenice* are of approximately even width throughout the band. Judging from the material in the B.M. (N.H.), the species is rare, but occurs sparsely over quite a wide area, extending from Ceram in the West to the Solomons and New Hebrides in the East. There are no specimens from the New Guinea mainland, but it may well be found there eventually, as a link between Ceram and Vulcan Island would seem probable. The genitalia differ from those of *berenice* in possessing a distinctly hooked apex to the clasper, and a more prolonged and pointed apex to the aedeagus.

(ii) *N. novaehebridensis vulcana* **ssp. n.**

(Pl. 1, fig. 4. Text-figs. 14 and 35)

Closely resembles *N. berenice*, only differing as follows : The male upperside on all wings possesses a bloom like that of a plum, which in certain lights glistens with a greenish reflection. The blue areas on the female fore wing are more restricted, and merge more gradually into the dark distal area. Beneath in both sexes, the colour on all wings is dull brown, in contrast

to the smooth and slightly shiny surface of *berenice* ; the pale striae enclosing the spots are more yellowish white. The markings are large, being arranged in the same general pattern as those of the nominate race, but whereas in the latter, the spotting is only slightly darker than the very pale ground colour, that of *vulcana* contrasts strongly, even on the darker ground.

Holotype ♂, NORTH NEW GUINEA : Vulcan Island (3° 45′ S., 145° 30′ E.), xi.i. 1913–14 (*Meek*), B.M. Type No. Rh. 16569.

Allotype ♀, D'ENTRECASTEAUX ISLANDS : Fergusson Island, ix–x.1914 (*Meek*), B.M. Type No. Rh. 16570.

Distribution. Ceram, Amboina, Aru, Vulcan, Fergusson, Goodenough and Bismarck Archipelago. (A single ♂ labelled " Alu I., (*Swinhoe Coll.*) " is probably so labelled in error.)

(iii) *N. novaehebridensis guizoensis* ssp. n.

(Pl. 1, fig. 5)

Smaller than the preceding, but otherwise identical on the upper surface of both sexes. Beneath the ground colour is darker ; all the light striae confining the spots are whiter, and those adjoining the submarginal lunules show a strong tendency to merge with those margining the outer edge of the median band, thus producing a whitish distal band in the majority of individuals.

Holotype ♂, SOLOMON ISLANDS : Guizo Island, xi.1903 (*A. S. Meek*), B.M. Type No. Rh. 16571.

Allotype ♀, as holotype, B.M. Type No. Rh. 16572.

Distribution. Choiseul, Isabel and Florida Island.

Nacaduba sumbawa sp. n.

(Text-fig. 27)

Like *berenice* in appearance, but on the male upperside shining purple, without any trace of blue ; the marginal dark line is hair-like, and the fringes are fuscous. The underside is of a softer more brownish shade, with the bands of spots darker, and without a definite pale stripe running through them ; the median spot in cellule 4 is placed obliquely with its lower extremity jutting outwards in the direction of the distal margin. All the whitish irrorations are indistinct. The female fore wing is shining sky-blue in the lower half of the cell, and the basal portions of cellules 1 to 4 becoming gradually lighter before merging with the wide costal and distal margins. At approximately 2 mm. from the distal margin in areas 1 to 4, there is a series of four indistinct pale interneural spots. The hind wing does not differ from that of *berenice*. Beneath like the male, but the submarginal series of markings are not noticeably darker than the basal and median spots. The male clasper is oval and concave, and the undulate distal margin is furnished with a prominent point at the ventral angle. In general structure, the aedeagus is like that of *beroe*, but the ventral terminal appendages are triangular in shape, their broad bases being almost half as wide as the length of the appendages.

Holotype ♂, " Sumbawa, ix, 1891 (W. Doherty) ", B.M. Type No. Rh. 16614.

Allotype ♀, same data, B.M. type No. Rh. 16615.

Nacaduba kurava (Moore)

(i) *N. kurava prominens* (Moore)

Lampides prominens Moore, 1877 : 341, Ceylon (Type !).

(ii) *N. kurava canaraica* Toxopeus

Nacaduba kurava canaraica Toxopeus, 1927 : 424, Karwar.
Nacaduba kurava canaraica f. belli Toxopeus, 1927 : 424, Coorg.

(iii) *N. kurava euplea* Fruhstorfer

Nacaduba perusia euplea Fruhstorfer, 1916 : 132, Sikkim (Type !).
Nacaduba kurava euplea f. evansi Toxopeus, 1927 : 424, E. Dawnas (Type !).
Nacaduba kurava ataranica Toxopeus, 1927 : 425, Ataran Valley (Type !).

(iv) *N. kurava septentrionalis* Shirôzu

Nacaduba kurava septentrionalis Shirôzu, 1952 : 22, Japan.

(v) *N. kurava therasia* Fruhstorfer

Nacaduba perusia therasia Fruhstorfer, 1916 : 133, Formosa (Type !).

(vi) *N. kurava sambalanga* **nom. n.**

Nacaduba kurava nicobarica Toxopeus, 1927 : 425, Nicobars, nec. *Lampides plumbeomicans nicobaricus*, Wood-Mason & de Niceville, 1881 : 234 = *Nacaduba berenice nicobaricus* Fruhstorfer, 1916 : 127.

(vii) *N. kurava nemana* Fruhstorfer

Nacaduba perusia nemana Fruhstorfer, 1916 : 134, Macromalayana (Type !).

(viii) *N. kurava mentawica* Riley

Nacaduba kurava mentawica Riley, 1944 : 259, pl. 1, fig. 10, Sipora.

(ix) *N. kurava niasica* Toxopeus

Nacaduba kurava niasica Toxopeus, 1927 : 426, Nias.

(x) *N. kurava kurava* (Moore)

Lycaena atratus Cramer ? ; Horsfield, 1828 : 78, nec. *Papilio aratus* Cramer, 1782, *Pap. Exot.* **4** : pl. 365, figs. A and B.
Lycaena aratus Moore, 1857 : 22.
Lycaena kurava Moore, 1857 : 22, Java (Type !).
Nacaduba kurava Toxopeus, 1927 : 423–432.
Nacaduba berenice isana Fruhstorfer, 1916 : 128, W. Java (Type !), **syn. n.**
Nacaduba perusia agorda Fruhstorfer, 1916 : 134, Java (Type !).

(xi) *N. kurava astapa* Fruhstorfer

Nacaduba perusia astapa Fruhstorfer, 1916 : 134, Bali (Type !).

(xii) *N. kurava baweana* Fruhstorfer

Nacaduba perusia baweana Fruhstorfer, 1916 : 134, Bawean (Type !).

(xiii) *N. kurava laurina* Fruhstorfer

Nacaduba perusia laurina Fruhstorfer, 1916 : 135, Lombok (Type !).

(xiv) *N. kurava laura* Doherty

Nacaduba laura Doherty, 1891 : 182, Sumba.

(xv) *N. kurava cerbara* Fruhstorfer

Nacaduba perusia cerbara Fruhstorfer, 1916 : 135, Key Is.

(xvi) *N. kurava parma* Waterhouse & Lyell

Nacaduba perusia parma Waterhouse & Lyell, 1914 : 95, figs. 290–293, Cape York.
Nacaduba perusia syrias Fruhstorfer, 1916 : 136, Cairns.

(xvii) *N. kurava felsina* Waterhouse & Lyell **stat. n.**

Nacaduba perusia felsina Waterhouse & Lyell, 1914 : 96, Darwin.

(xviii) *N. kurava perusia* (Felder)

Lycaena perusia Felder, 1860 : 458, Amboina (Type !).
Lycaena niconia Felder, 1860 : 458, Amboina (Type !).

(xix) *N. kurava bandana* (Swinhoe) **comb. n.**

Euaspa bandana Swinhoe, 1916 : 210, Banda (Type !).

(xx) *N. kurava albofasciata* (Röber)

Plebeius albofasciatus Röber, 1886 : 65, pl. 4, figs. 21, Aru.

(xxi) *N. kurava cyaneira* Fruhstorfer

Nacaduba perusia cyaneira Fruhstorfer, 1916 : 136, New Guinea.

(xxii) *N. kurava lydia* Fruhstorfer

(Text-fig. 19)

Nacaduba perusia lydia Fruhstorfer, 1916 : 136, Louisiades.

(xxiii) *N. kurava pacifica* Toxopeus

Nacaduba kurava pacifica Toxopeus, 1927 : 431, Goodenough I. (Type !).

(xxiv) *N. kurava rothschildi* Toxopeus

Nacaduba kurava rothschildi Toxopeus, 1927 : 430, St. Aignan (Type !).

(xxv) *N. kurava ariitia* Fruhstorfer

Nacaduba perusia ariitia Fruhstorfer, 1916 : 137, Bismarcks.

(xxvi) *N. kurava euretes* Druce **stat. n.**

Nacaduba euretes Druce, 1891 : 360, pl. 31, figs. 6–7, Aola (Type !).

Nacaduba mallicollo Druce

(i) *N. mallicollo mallicollo* Druce **stat. n.**

(Text-fig. 24)

Nacaduba mallicollo Druce, 1892 : 439, New Hebrides (Type !).

Although the original description commences with the male symbol, Druce actually described and figured the female. He followed the description with the casual remark, " The male of this insect in the British Museum is a uniform violaceous blue, with narrow linear brown borders." This specimen is still in the B.M. (N.H.), and the author was quite correct in supposing it to belong to *mallicollo*. In appearance it is very like those forms of *kurava* that do not exhibit a white band on the underside, but the submarginal lunules are large, dark, and each shaped like a capital D, the convex side being always directed outwardly. The male genitalia are of the same general pattern as those of *kurava*, but the claspers are shorter with only seven or eight teeth on their distal edge ; the hooked apex is much compressed, and is produced to an inwardly directed sharp point.

The material in the B.M. (N.H.) is as follows. NEW HEBRIDES : Mallicollo I. (*Woodford*), 4 ♀ ; Tanna, 23.iv.1875, 1 ♂, 1 ♀ ; Iles Vati, Mallicollo, et Santo, 1914 (*J. Kowalski*), 1 ♀.

(ii) *N. mallicollo markira* **ssp. n.**

(Pl. 1, figs. 1–2)

The male above is purple with a slaty tinge, and all the wings are margined by a definite black line. On the hind wing, this is bordered inwardly by white interneural streaks which

become progressively finer as they approach the apex ; the submarginal lunules are visible mainly by transparency. Beneath, the white banding is very wide, the submarginal markings are larger and darker, and the median band of spots approaches much nearer to the margin than in the nominate race. The hind wing tornal spot is large. The female has an almost white ground colour on all wings beneath ; on this ground, the spotting is represented in outline only by a series of pale brown parallel lines. The white areas above are more extended, and less heavily overlaid with blue, than in the New Hebridean female. Length of fore wing : ♂ 14 mm., ♀ 12 mm.

Holotype ♂, Solomon Islands : S. Christoval, Markira Harbour, 1–9.v.1908 (*A. S. Meek*), B.M. Type No. Rh. 16573.

Allotype ♀, as holotype, B.M. Type No. Rh. 16574.

Other material. Solomon Islands : as holotype, 1 ♀ ; Vella Lavella, ii.1908 (*A. S. Meek*), 1 ♂ ; St. Anna (*Woodford*), 1 ♀.

(iii) *N. mallicollo biakana* **ssp. n.**

The male is larger than that of the foregoing, the fore wing attaining a length of 17 mm. In colour it is deep purple on all wings, and it shows only the slightest indication of a thread-like marginal line. On the underside, the white banding and the submarginal lunules are like those of the nominate race.

Holotype ♂, Schouten Islands : Biak, vi.1914 (*A., C., and F. Pratt*) B.M. Type No. Rh. 16575.

***Nacaduba mioswara* sp. n.**

(Pl. 1, fig. 3. Text-figs. 11 and 44)

All wings above are smoky purple with a linear dark margin, this is bordered inwardly on the hind wing by a whitish line, which is wide at the tornus but narrows as it approaches the apex. The tornal spot in area 2 is in some examples joined by spots in areas 1 and 3. On the underside, the discal spotting is scarcely darker than the grey-brown ground, but it is made quite evident by the fine but clear white reticulations ; all the submarginal markings are decidedly darker grey-brown, and the spots in areas 1 and 2 are black with some metallic scaling, and crowned with golden yellow. The male genitalia provide the surest means of identification ; the clasper has an excised and irregular distal margin, and a produced hood-like apical portion with three inwardly directed points. The aedeagus is short and stout and terminates ventrally with a rather blunt point.

Holotype ♂, North New Guinea : Geelvink Bay, Mioswar, x.1909 (*C. and F. Pratt*), B.M. Type No. Rh. 16576.

Other material. As holotype, ix–x.1909, 12 ♂ ; Bismarck Archipelago : New Hanover, ii–iii.1897 (*Webster*), 1 ♂ ; New Hanover, ii.1923 (*A. S. Meek*), 1 ♂.

***Nacaduba lucana* sp. n.**

(Pl. 1, figs. 6, 7 and 8. Text-figs. 20 and 31)

The male upperside is violaceous blue with linear dark margins on all wings, and indications of submarginal black spots in areas 1 and 2 of the hind wings. On all wings in the female, the basal portions are shining blue—similar in tint to that of the male *Polyommatus eros* ; the costa, the upper half of the discoidal cell, the apex, and the distal parts of areas 1 to 3, on the fore wing are fuscous ; the blue area on the hind wing is restricted to the cell and the basal portions of areas 1 to 3, and gradually merges with the fuscous remainder of the wing ; all the submarginal markings are outlined with chalky white. Beneath the ground colour is earth-

brown in both sexes, the discal and basal spots being formed by pairs of parallel, externally white margined, dark lines, the intervals between these lines being of a lighter shade than the ground. The submarginal markings are blackish-brown sharply margined with white, and the hind wing black tornal spot is completely encircled with golden-yellow, even on its distal edge ; this peculiarity occurs throughout the series, and has not been observed in any other species in the genus. The male clasper is produced apically to form a prong-like structure, with two inwardly directed points on its ventral edge ; a ventral view of the claspers creates an impression of the head structure of the Stag Beetle (*Lucanus cervus*). The aedeagus is large as compared with the clasper ; it widens progressively from the base, and terminates ventrally with a pair of projecting pointed appendages.

Holotype ♂, BISMARCK ARCHIPELAGO : Witu (or French Is.) (5° 0′ S., 149° 15′ E.), vi.1925 (*A. F. Eichhorn*), B.M. Type No. Rh. 16577.

Allotype ♀, as holotype, B.M. Type No. Rh. 16578.

Other material. As holotype, 8 ♂, 9 ♀ ; New Hanover, ii.1923 (*A. S. Meek*), 1 ♂.

Nacaduba beroe (Felder)

(i) *N. beroe minima* Toxopeus

Nacaduba beroe minima Toxopeus, 1927 : 433, Kandy.

(ii) *N. beroe gythion* Fruhstorfer

Nacaduba atrata gythion Fruhstorfer, 1916 : 131, Assam (Type !).

(iii) *N. beroe asakusa* Fruhstorfer

Nacaduba atrata asakusa Fruhstorfer, 1916 : 132, Formosa (Type !).

(iv) *N. beroe neon* Fruhstorfer

Nacaduba atrata neon Fruhstorfer, 1916 : 131, NE. Sumatra (Type !).

(v) *N. beroe jedja* Fruhstorfer

Nacaduba atrata jedja Fruhstorfer, 1916 : 131, Nias (Type !).

(vi) *N. beroe javana* Toxopeus

Nacaduba beroe javana Toxopeus, 1927 : 433, W. Java.

(vii) *N. beroe bimaculosa* Toxopeus

Nacaduba beroe bimaculosa Toxopeus, 1929 : 234, E. Java.

(viii) *N. beroe beroe* (Felder)
(Text-figs. 16 and 30)

Lycaena beroe Felder, 1865 : 275, Luzon (Type !).

Nacaduba major Rothschild **stat. n.**

(Text-figs. 15 and 32)

Nacaduba berenice major Rothschild, 1915 : 139, N. Ceram (Type !).

There are in the B.M. (N.H.) examples of both *N. beroe* and *N. major* that were captured in Central Ceram by the Pratt brothers ; from this it would seem that—in spite of genitalic and other similarities—they should not be treated as subspecies, but as distinct species ; especially so, when one considers the close genitalic relationship of both species with the superficially very different *N. ruficirca*—to be described below—which occurs with *major* in New Guinea.

Compared with *beroe* : the male is slightly larger (fore wing length 16 mm.), with a rather more pointed apex to the fore wing ; the underside ground is darker, and all the pale striations

are whiter and more widely spaced. In *beroe* the extremities of the tornal orange lunule on the hind wing are continued down veins 2 and 3 as far as the margin, whereas those of *major* terminate at least 1 mm. from the margin. The male genitalia differ by the greater length of the clasper, its deeply concave dorsal edge, and the more numerous inwardly directed apical points ; these points number 6 to 8, but are difficult to count as they are so bunched together that they are never all in view at the same time.

Material in B.M. (N.H.). CERAM : Wahai (*E. Streseman*), 1 ♂ (holotype) ; Manusela, 6,000 ft., x–xi.1919 (*C., F. and J. Pratt*), 1 ♂. NEW GUINEA : Arfak, Mt. Siwi, 800 m., 1928 (*E. Mayr*), 5 ♂ ; Mafulu, 4,000 ft., i.1934 (*L. E. Cheesman*), 1 ♂ ; Kapaur, xii.1896 (*Doherty*), 1 ♂ ; Upper Aroa River (*Meek*), 3 ♂ ; Hydrographer Mts., 2,500 ft., 1918 (*Eichhorn Bros.*), 8 ♂. BISMARCK ARCHIPELAGO : New Britain, Talesea, ii–iii.1925 (*A. F. Eichhorn*), 2 ♂.

Nacaduba ruficirca sp. n.

(Pl. 1, figs. 19–20. Text-figs. 17 and 33)

Length of fore wing in both sexes : 13–14 mm. The wings of the male are narrow, the fore wing apex pointed, and the hind wing bears a short tail. Above, all wings are reddish purple, and show by refraction a frosty sheen ; the submarginal areas are slightly clouded by a scattering of dusky scales, which serves to blend the purple into the dusky marginal line. On the hind wing, the dark spot in cellule 2 is often accompanied by lesser spots in cellules 1 and 3, those in 1 and 2 being bordered outwardly by a pale stripe. Beneath the predominant colour is warm brown, the fine striations being off-white in colour. The hind wing tornal orange markings are of a more reddish hue than are those of any other member of the genus. In the female, the costal and distal margins of the primaries are widely dusky brown, the remainder of the wing being lavender-blue ; which colour extends from the base, through the lower half of the cell to the inner third of area 4, between veins 2 and 3 to within 3 mm. of the margin, and below vein 2 to within 2 mm. of the margin. The secondaries are dusky brown from the costa to vein 6 ; below this, the basal and discal areas are lavender-blue somewhat obscured by dusky scaling, and veins 1 to 4 are heavily scaled with fuscous ; the very distinct marginal and submarginal markings are present in all areas below vein 6 ; the spots are sharply outlined with white, and the lunules are acutely pointed inwardly. The male genitalia closely resemble those of the two preceding species ; the clasper is short like that of *beroe*, but its apical points are bunched like those of *major*, and set at a rather more obtuse angle.

Holotype ♂, BRITISH NEW GUINEA : Hydrographer Mts., 2,500 ft., iv–v.1918 (*Eichhorn Bros.*), B.M. Type No. Rh. 16579

Allotype ♀, as holotype, B.M. Type No. Rh. 16580.

Other material. NEW GUINEA : as holotype, 4 ♂ ; Aroa River (*Meek*), 11 ♂ ; Mambare R., Biagi, 5,000 ft., i–iii.1906 (*Meek*), 5 ♂ ; Arfak, Mt. Siwi, 800 m., iv–vi. 1928 (*E. Mayr*), 23 ♂ ; Arfak, Ditschi, v–vi. 1928 (*E. Mayr*), 1 ♂ ; Kratke Mts., Buntibasa Distr., 4–5,000 ft., vi.1932 (*F. Shaw-Mayer*), 1 ♂ ; Wandammen Mts., 3–4,000 ft., xi.1914 (*Pratt Bros.*), 2 ♂ ; Arfak, Angi Lakes, 8,000 ft., i–ii.1914 (*Pratt Bros.*) , 1 ♂ ; 2 days N. of Fak Fak, 1,700 ft., xi.1907 (*A. E. Pratt*), 1 ♂ ; Weyland Mts., 3,500 ft., vi.1920 (*A. E. Pratt*), 1 ♂ ; Snow Mts., Near Oetakwa River, up to 3,500 ft., x–xii.1910 (*Meek*), 1 ♂ ; Snow Mts., Utakwa R., 4–6,000 ft., xii–i.1912–13 (*A. F. R. Wollaston*), 1 ♂.

Nacaduba calauria (Felder)

(i) *N. calauria evansi* Toxopeus

Nacaduba calauria evansi Toxopeus, 1927 : 434, Ceylon.
Nacaduba calauria toxopeusi Corbet, 1938 : 138, Ceylon, **syn. n.**

Corbet proposed the name *toxopeusi* for the Ceylon race on the grounds that *evansi* Toxopeus was a primary homonym of *N. kurava euplea d.s.f. evansi* Toxopeus 1927 : 424, but as the latter was described as a mere form, the name has no standing in nomenclature, and *N. calauria evansi* Toxopeus can stand as the valid name.

(ii) *N. calauria malayica* Corbet

Nacaduba calauria malayica Corbet, 1938 : 137, pl. 1, figs. 4 and 33, Malay Pen. (Type !).

(iii) *N. calauria cypria* Toxopeus

Nacaduba calauria cypria Toxopeus, 1929 : 234, W. Java.

(iv) *N. calauria calauria* (Felder)
(Text-figs. 25 and 38)

Lycaena calauria Felder, 1860 : 457, Amboina (Type !).

Nacaduba tristis Rothschild

(Text-figs. 26 and 37)

Nacaduba tristis Rothschild, 1915 : 29, Utakwa River (Type !).

This species has been treated as a subspecies of *N. berenice* by various authors, but examination of the male genitalia of the type reveals a close relationship with *N. calauria*. The last named species is found from Ceylon, through Malaya and the Sunda Islands to the Moluccas, Dutch New Guinea and New Britain ; while *tristis* occurs in Obi, Ceram, and New Guinea. The ranges of the two species overlap in Ceram, Dutch New Guinea and the Schouten Islands. These two species are indistinguishable above, and the only differential character in *tristis* below is the outward displacement of median spot 5 on the fore wing, which gives the median band a distinctly angled effect. The male armatures are structurally similar, but the *tristis* clasper is smaller, the distal teeth larger in proportion and more pointed ; the dorsal margin is more strongly convex. In the aedeagus the vesical cornuti—so obvious in all preparations of *calauria* examined—cannot be discerned.

Nacaduba glauconia (Snellen)

(Text-figs. 21 and 34)

(i) *N. glauconia glauconia* (Snellen)

Lycaena glauca Snellen, 1892 : 142, Java.
Lycaena glauconia Snellen, 1901 : 264, n. n. for *Lycaena glauca*.

(ii) *N. glauconia overdijkinki* Toxopeus

Nacaduba glauconia overdijkinki Toxopeus, 1929 : 236, E. Java.

Nacaduba dyopa (Herrich-Schaeffer)

(Text-figs. 29 and 39)

Lycaena dyopa Herrich-Schaffer, 1869 : 75, Overlau.
Catochrysops vitiensis Butler, 1883 : 389, Viti Island (Type !), **syn. n.**

Nacaduba gemmata Druce, 1887 : 204, Fiji Is. (Type !), **syn. n.**
Nacaduba vitiensis Druce, 1892 : 437.
Nacaduba gemmata Druce, 1892 : 437.
Nacaduba dyopa Druce, 1892 : 437.

Druce pointed out that *gemmata* was a synonym of *vitiensis* Butler, and suggested that the latter might prove to be synonymic with *dyopa*. Careful study of Herrich-Schaeffer's description and Butler's type makes the suggestion a certainty. In addition to 18 ♂ and 13 ♀ from Fiji, there are in the B.M. 1 ♂ from New Hebrides, 1 ♂ and 4 ♀ from Tonga and 1 ♂ and 1 ♀ from Samoa.

Nacaduba samoensis Druce

(Text-figs. 23 and 40)

Nacaduba samoensis Druce, 1892 : 437, pl. 27, figs. 5–6, Samoa (Type !).
Nacaduba vitiensis samoensis Hopkins, 1927 : 56 (part).

On the evidence of the male genitalia, there is no doubt that this is a distinct species, despite its close superficial resemblance to *dyopa*. The elongate clasper bends outwards in sweeping curves to its cup-shaped apex, which is produced inwardly to terminate in a curved point. The aedeagus is curved and somewhat narrowed before the apex ; an unusual feature is the presence of two sabre-like structures—one on each side of the organ—which commence near the base and curve gently downwards, protruding ventrally at about three-quarter the penis length ; they may be extensions of the anellus. Druce has well described the external points of difference with *dyopa*. Evidently the two species occur together in Samoa, and the presence of four examples of *samoensis* from Fiji in the B.M. (N.H.) suggests that further collecting might reveal its presence in other Pacific islands.

Material in B.M. (N.H.) : SAMOA : (*G. F. Mathew*), 1 ♂ (holotype) ; Upolu, Apia, 9.vii.1922 (*J. S. Armstrong*), 2 ♂, 2 ♀ ; FIJI : Suva, 1895 (*Woodford*), 1 ♂ ; Ovalau (*Mus. Godeffroy*, ex. Felder Coll.), 1 ♀.

Nacaduba deplorans (Butler)

(Text-figs. 22 and 41)

Lampides deplorans Butler, 1875 : 614, Loyalty Islands (Type !).

Nacaduba deliana (Snellen)

Lycaena deliana Snellen, 1892 : 139, Java.
Lycaena deliana Piepers & Snellen, 1918 : 51, pl. 22, fig. 70.

As no specimens are available for study this name is tentatively placed here.

Nacaduba biocellata (Felder)

Although this species bears a close resemblance to some members of the genus *Prosotas*, the very distinctive shape of the male clasper indicates no close relationship ; so for the purpose of this paper the species is retained in *Nacaduba*.

(i) *N. biocellata biocellata* (Felder)

(Text-figs. 28 and 42)

Lycaena biocellata Felder, 1865 : 280, pl. 35, fig. 14, Adelaide (Type !).

(ii) *N. biocellata armillata* (Butler)

Lampides armillata Butler, 1875 : 614, Vaté (Type !).

(iii) *N. biocellata baliensis* **ssp. n.**

Smaller than the nominate race, the male fore wing only attaining a length of from 8 to 10 mm. All wings are smoky purple above as in ssp. *armillata*, and are never clear purple as in Australian examples. The brown marginal band is just over 1 mm. in width, noticeably wider than in either of the other races. In the female the ground colour is unicolorous brown without any blue scaling whatever. The underside exhibits no differential characters. Presence in the B.M. (N.H.) of single specimens from Sumba & Kisser would suggest that this race may have been overlooked by collectors and may occur over a wide area in the Sunda Islands.

Holotype ♂, W. BALI : Gilmanoek, v.1935 (*J. P. A. Kalis*), B.M. Type No. Rh. 16581.

Allotype ♀, as holotype, B.M. Type No. Rh. 16582.

Other material. As holotype, 16 ♂, 2 ♀; LESSER SUNDA ISLANDS : Sumba, x.1891 (*W. Doherty*), 1 ♀; Kisser I. (*Kuhn*), 1 ♂.

Nacaduba nebulosa Druce

Nacaduba nebulosa Druce, 1892 : 440, pl. 27, figs. 10–11, New Hebrides (Type !).

This species is represented in the B.M. (N.H.) by the male holotype (without an abdomen), the female allotype and four other females, all from New Hebrides. It is therefore not possible to come to a decision regarding its true affinities.

Nacaduba cladara Holland

Nacaduba cladara Holland, 1900 : 73, Buru.

Nacaduba glenis Holland

Nacaduba glenis Holland, 1900 : 74, Buru.

The above two names are appended here, as it has not been possible to identify either of them from the descriptions.

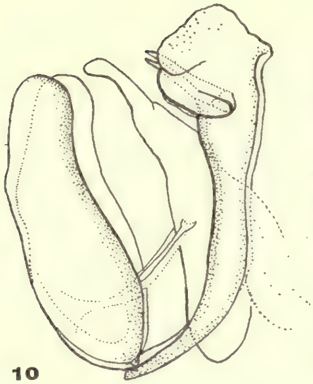
PROSOTAS Druce

Prosotas Druce, 1891 : 366, pl. 31, fig. 15, Type species : *Prosotas caliginosa* Druce.
Prosotas Druce ; Toxopeus, 1929 : 237.

The genus as described by Druce was monotypical, and characterized by the almost complete anastomosis of the costal and first subcostal nervures. Toxopeus quoted this character, but included in the genus several species in which these

FIG. 10. ♂ genital armature, *Nacaduba astarte plumbata*.

FIGS. 11–29. ♂ clasper : 11, *Nacaduba mioswara* ; 12, *N. sericina* ; 13, *N. cajetani* ; 14, *N. novaehebridensis vulcana* ; 15, *N. major* ; 16, *N. beroe* ; 17, *N. ruficirca* ; 18, *Petrelaea dana* ; 19, *N. kurava lydia* ; 20, *N. lucana* ; 21, *N. glauconia* ; 22, *N. deplorans* ; 23, *N. samoensis* ; 24, *N. mallicollo* ; 25, *N. calauria* ; 26, *N. tristis* ; 27, *N. sumbawa* ; 28, *N. biocellata* ; 29, *N. dyopa*.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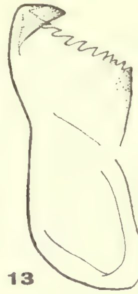
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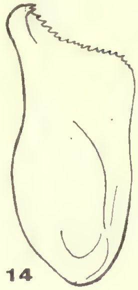
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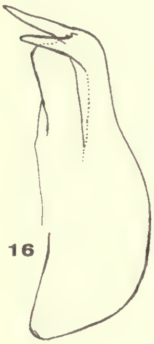
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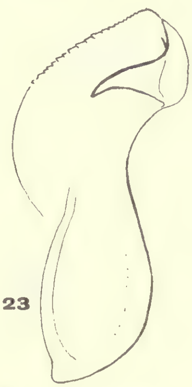
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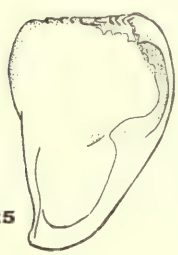
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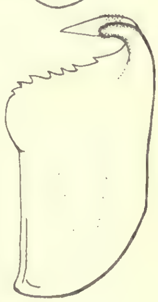
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nervures are joined for a short distance, then separate and reach the costa independantly as in true *Nacaduba*. Without denuding the wings it is, in some cases, difficult to observe the final course of the costal nervure, and this may explain his apparent failure to notice the inconsistency. However, the same author points out differences in the palpi, the general habit of life, and the uniform formation of the male claspers of all the species concerned. It would therefore seem that we are dealing here with a natural group of related species, and it is intended to follow Toxopeus and include under *Prosotas* all those species having simple claspers terminating in a pointed hook (Text-figs. 46–52, 54–60, 62 and 63), , and an aedeagus with a truncate branch-like process arising ventrally from just below the apex (Text-figs. 53 and 61).

Prosotas aluta (Druce)

(i) *P. aluta coelestis* (Wood-Mason & de Niceville)

(Text-fig. 46)

Nacaduba coelestis Wood-Mason & de Niceville, 1886 : 366, pl. 17, fig. 11, Andamans.
Nacaduba aluta coelestis Fruhstorfer, 1916 : 119.

(ii) *P. aluta nanda* (de Niceville)

Nacaduba nanda de Niceville, 1895 : 34, pl. S, fig. 23, NE. Sumatra.
Nacaduba aluta nanda Fruhstorfer, 1916 : 119.

(iii) *P. aluta lessina* (Fruhstorfer)

Nacaduba aluta lessina Fruhstorfer, 1916 : 119, Nias (Type !).

(iv) *P. aluta aluta* (Druce)

Cupido aluta Druce, 1873 : 349, pl. 32, fig. 8, Borneo (Type !).

(v) *P. aluta philiata* (Fruhstorfer)

Nacaduba aluta philiata Fruhstorfer, 1916 : 119, Philippines (Type !).

(vi) *P. aluta alutina* (Fruhstorfer)

Nacaduba aluta alutina Fruhstorfer, 1916 : 120, N. Celebes (Type !).

Prosotas nelides (de Niceville)

(Text-fig. 47)

Nacaduba nelides de Niceville, 1895 : 280, pl. O, fig. 24, NE. Sumatra (Type !).

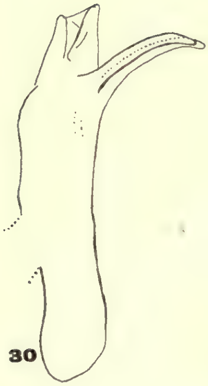
Prosotas nora (Felder)

(i) *P. nora ardates* (Moore)

(Text-figs. 48 and 53)

Lycaena ardates Moore, 1874 : 574, pl. 67, fig. 1, Cashmere (Type !).
Nacaduba kodi Evans, 1910 : 387, Palni Hills (Type !).

FIGS. 30–45. ♂ aedeagus : 30, *Nacaduba beroe* ; 31, *N. lucana* ; 32, *N. major* ; 33, *N. ruficirca* ; 34, *N. glauconia* ; 35, *N. novaehebridensis vulcana* ; 36, *N. cajetani* ; 37, *N. tristis* ; 38, *N. calauria* ; 39, *N. dyopa* ; 40, *N. samoensis* ; 41, *N. deplorans* ; 42, *N. biocellata* ; 43, *N. sericina* ; 44, *N. mioswara* ; 45, *Petrelaea dana*.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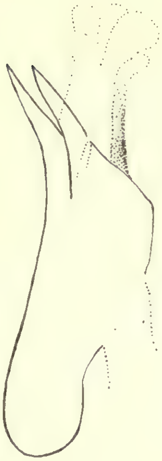
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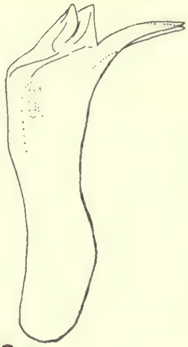
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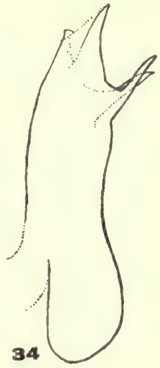
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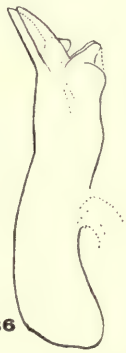
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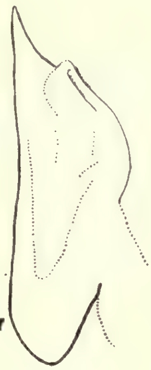
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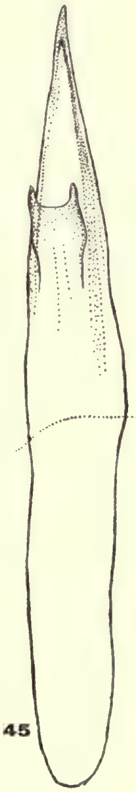
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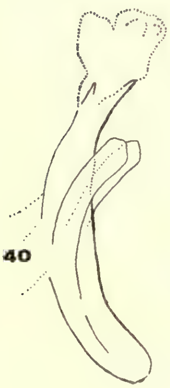
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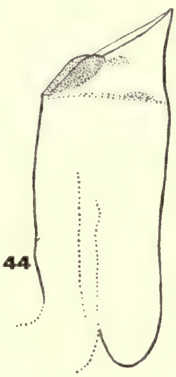
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(ii) *P. nora fulva* (Evans) **comb. n**

Nacaduba dubiosa fulva Evans, 1925 : 613, Andamans (Type !).

The type is a female in poor condition, without an abdomen, and the margins are so damaged that no indication of a tail at vein 2 of the hind wing is discernible. Comparison with the Andamanese specimens in the B.M. (N.H.) reveals without doubt that it really belongs to *P. nora*. *P. dubiosa* is represented in the B.M., from the Andamans, by only one male and four females, and these are not noticeably different from Indian examples of that species.

(iii) *P. nora dilata* (Evans)

Nacaduba nora dilata Evans, 1932 : 243, Nicobars (Type !).

(iv) *P. nora formosana* (Fruhstorfer)

Nacaduba nora formosana Fruhstorfer, 1916 : 116, Formosa (Type !).

(v) *P. nora superdates* (Fruhstorfer)

Nacaduba nora donina f. superdates, Fruhstorfer, 1916 : 117, Java (Type !).

(vi) *P. nora kupu* (Kheil)

Plebeius kupu Kheil, 1884 : 29, pl. 5, fig. 34, Nias.

(Type ? A specimen from the Fruhstorfer collection in the B.M. (N.H.) is labelled in Fruhstorfer's writing as the type).

(vii) *P. nora meraha* (Fruhstorfer)

Nacaduba nora meraha Fruhstorfer, 1916 : 117, Engano (Type !).

(viii) *P. nora semperi* (Fruhstorfer)

Nacaduba nora semperi Fruhstorfer, 1916 : 116, S. Philippines (Type !).

(ix) *P. nora nora* (Felder)

Lycaena nora Felder, 1860 : 458, Amboina (Type !).

(x) *P. nora auletes* (Waterhouse & Lyell)

Nacaduba nora auletes Waterhouse & Lyell, 1914 : 98, figs. 353–355, Cape York.

Prosotas atra **sp. n.**

(Pl. 1, figs. 10–11. Text-fig. 49)

The upper surface of the male is unicoloured dull sooty brown, and the cilia are grey-brown with a darker line running through them. In size and shape the insect is very like *P. nora*. On the under surface the pattern is similar to that of *nora*, but the median band on the fore wing is moved slightly inwards and the submarginal lunules are very faint; this gives the outer portion of the wing a rather bare appearance. On the hind wing, besides the metallic flecked black tornal spot, there are a pair of smaller metallic spots in area 1, and a single one in area 3, all are margined internally by sandy-yellow chevrons. The female is above paler brown, with just a hint of olive in its composition, its only markings being a series of blackish submarginal spots on the hind wing, sharply outlined in bluish white. On the underside it is like the male, but the ground is more pale yellow-brown, and the bands are rather narrower.

Holotype ♂, New Britain : Talesea, iii–iv.1925 (*A. F. Eichhorn*), B.M. Type No. Rh. 16583.

Allotype ♀, as holotype, B.M. Type No. Rh. 16584.

Other material. New Britain : as holotype, 6 ♂. New Guinea : Kumusi R., v–ix.1907 (*A. S. Meek*), 3 ♂; Milne Bay, xi.1898 (*A. S. Meek*), 1 ♂; Dorey Bay,

Andai, 1892 (*W. Doherty*), 1 ♂; Geelvink Bay, Wandesi, 1892 (*W. Doherty*), 1 ♂. CERAM: Piroe, 4.ii.1909 (*J. C. Kershaw*), 1 ♂.

Prosotas talesea **sp. n.**

(Pl. 1, figs 12–13. Text-fig 50)

Apart from a rather stronger dark marginal line, the upperside of the male scarcely differs from that surface in *P. nora*. The female also closely resembles the *nora* female from the Bismark Archipelago. Beneath, both sexes can be easily recognized by the warm brown colour, the prominent marginal and submarginal markings, and by the creamy yellow band that traverses the hind wing, filling the entire area between the median band and the submarginal lunules. The male clasper is broad at the base, diminishing evenly in width and proceeding in a regular curve to a fine pointed apex.

Holotype ♂, NEW BRITAIN: Talesea, ii.1925 (*A. F. Eichhorn*), B.M. Type No. Rh. 16585.

Allotype ♀, as holotype, iii–vi.1925, B.M. Type No. Rh. 16586.

Other material. As holotype, ii–iii, 1925, 6 ♀.

Prosotas papuana **sp. n.**

(Pl. 1, figs. 14–15. Text-fig. 51)

This is another species having a strong resemblance in appearance and size to *P. nora*. It differs in the shape of the male clasper which is similar to that of *P. pia*. In contrast to *nora*, the male is of a distinctly more reddish-purple tint, with a heavier dark marginal line on all wings. On the hind wing, the tornal black spot in area 2, and the bifid spot in area 1, are evident above, and both are margined distally with a fine white line. The female is dark brown above, in contrast to the greyish fuscous hue of *nora*; the blue area on the fore wing is reduced to a few scattered blue scales in the centre of the wing. On the hind wing the submarginal series of spots are encircled by dingy pale lunules, and so are less obvious than those of *nora*, which has clearly defined white ones. The under surface in both sexes is clear light brown, without the yellow and grey tints of *nora*; its markings are similar to those of that species, but the orange tornal crescent is replaced by a bright red one.

Holotype ♂, BRITISH NEW GUINEA: Hydrographer Mts., 2,500 ft., iv–v.1918 (*Eichhorn Bros.*), B.M. Type No. Rh. 16587.

Allotype ♀, data as holotype, B.M. Type No. Rh. 16588.

Other material. NEW GUINEA: as holotype, i–v.1918, 12 ♂, 2 ♀; Welsh River (*Weiske*), 1 ♂; Upper Aroa R. (*Meek*), 1 ♂; Ninay Valley, 1908–09 (*A. E. Pratt*), 2 ♂; Weyland Mts., 3,500 ft., vi.1920 (*Pratt Bros.*), 1 ♂; Arfak Mts., Angi Lakes, 6,000 ft. (*Pratt Bros.*), 1 ♂; Kratke Mts., Buntibasa, 4–5,000 ft., v.1932 (*F. Shaw-Mayer*), 5 ♂; Snow Mts., Nr. Oetakwa R., up to 3,500 ft., x–xii.1910 (*Meek*), 1 ♀.

Prosotas felderi (Murray)

(Text-fig. 52)

Lycaena felderi Murray, 1874: 527, Queensland.
Lycaena mackayensis Miskin, 1890: 35, Mackay.

Prosotas pia Toxopeus

Examination of the male genitalia reveals that although *P. pia* so closely resembles *P. nora* superficially, it must be regarded as a distinct species ; its short and broad clasper at once identifies the insect. Additional evidence is now provided by the discovery of the extra-Javan races listed below.

(i) *P. pia marginata* ssp. n.

(Pl. 1, figs. 16–17)

In the early stages of preparation for this work, a letter was received from Col. J. N. Eliot in which he described in his series of *nora* a male, taken by himself in Sikkim, which he felt sure was an undescribed species. Investigation of the material in the B.M. (N.H.) elicited the surprising fact that a race of *pia* occurs together with *nora* over a large range extending from Sikkim and Assam to Burma, of which Col. Eliot's insect is an example.

It differs from *nora* as follows : the male ground colour is of a more slate-blue tint ; the dusky margins are wider, in some examples approaching a width of 1 mm. ; the female is indistinguishable above from that sex of *nora*. Beneath, both sexes are variable but always lighter in colour, with the much darker markings contrasting strongly ; the spot below the fore wing cell centre is usually reduced. A considerable degree of individual variation is discernible, extreme dry season males being paler, almost lilac above, and having a much simplified pattern on a lighter ground beneath. In doubtful cases the male genitalia furnish a sure guide.

Holotype ♂, ASSAM : Naga Hills, Kirbari, 10–24.vii.1912 (*Tytler*), B.M. Type No. Rh. 16589.

Allotype ♀, ASSAM : Manipur, Imphal, 21.v.1911 (*Tytler*), B.M. Type No. Rh. 16590.

Other material. Numerous localities in Sikkim, Assam and Burma, 102 ♂, 19 ♀.

(ii) *P. pia pia* Toxopeus

(Pl. 1, fig. 18., pl. 2, fig. 9 Text-fig. 55)

Prosotas pia Toxopeus, 1929 : 241, W. Java (Paratypes !).

Specimens from Malaya, Sumatra and Borneo are not separable from those of Java.

(iii) *P. pia elioti* ssp. n.

The male is deep purple on the upperside, deeper in tint than either of the preceding subspecies ; this colour has a brownish tinge in certain lights ; the dark marginal line is threadlike. The bases of the wings are somewhat darkened but bear a thin scattering of blue scales. The underside is dull earth-brown ; its marginal markings are evanescent, while the brown bands and spots on the remainder of the wings are emphasized by parallel darker lines which are outwardly margined with fine white lines. Whereas the female of *nora* from Celebes is normally completely black-brown above, and of a decidedly yellow tone beneath, that sex of *elioti* exhibits a greenish-blue patch in the centre of the fore wing and a pale olive-brown underside.

This race is described from three specimens generously presented to the B.M. (N.H.) by its discoverer Col. J. N. Eliot.

Holotype ♂, S. Celebes : Malino, 3,000 ft., 14.vi.1937 (*J. N. Eliot*), B.M. Type No. Rh. 16591.

Allotype ♀ data as holotype, B.M. Type No. Rh. 16592.

Other material. As holotype, 1 ♀.

(iv) *P. pia ceramensis* ssp. n.

Prosotas parrhasius (*nora*) *rothschildi* Toxopeus (misidentification), 1930 : 100, Ceram.

The male upperside differs from that of *nora* by the presence of a nebulous dark marginal band of up to 1 mm. in width on all wings. Dusky tornal spots, each accompanied externally by a pale interneural stripe, are vaguely observable on the hind wing. Beneath the colour is greyish, and the submarginal markings are evanescent as in *pia* and *elioti*. The female can best be distinguished from that sex of *nora* by its brown underside, which is in distinct contrast to the bright yellow one of Ceram examples of that species.

This is the insect confused by Toxopeus with *Nacaduba felderi* Rothschild, and renamed by him *rothschildi*. The latter name is discussed under *N. cajetani* (see p. 79).

Holotype ♂, Ceram : Manusela, 650 m., 1912 (*E. Stresemann*), B.M. Type No. Rh. 16593.

Allotype ♀, Ceram : Manusela, 6,000 ft., x–xii.1919 (*Pratt Bros.*), B.M. Type No. Rh. 16594.

Other material. As holotype, 8 ♂ ; as allotype, 3 ♂, 4 ♀ ; Ceram I., x–xi.1909 (*W. Stalker*), 3 ♂.

Prosotas ella Toxopeus

(Text-fig. 56)

Prosotas ella Toxopeus, 1930 : 188, Palu, Centr. Celebes.

Prosotas norina Toxopeus

Prosotas norina Toxopeus, 1929 : 239, Java.

It has not been possible to identify any specimen of this species, and the name is placed here provisionally.

Prosotas bhutea (de Niceville)

(Text-fig. 57)

Nacaduba bhutea de Niceville, 1883 : 72, pl. 1, fig. 13, Sikkim.

Prosotas datarica (Snellen)

(Text-fig. 58)

Lycaena datarica Snellen, 1892 : 140, Java.
Lycaena datarica Piepers & Snellen, 1918 : 42, pl. 21, figs. 57*a–b*.
Prosotas subardates Toxopeus, 1929 : 242, Java.

Prosotas gracilis (Röber)

(i) *P. gracilis ni* (de Nivecille)

(Text-fig. 59)

Nacaduba ni de Niceville, 1902 : 247, NE. Sumatra.
? *Nacaduba basiatrata* Strand, 1910 : 203, Sumatra, **syn. n.**

(ii) *P. gracilis donina* (Snellen)

Lycaena donina Snellen, 1901 : 262, W. Java.

(iii) *P. gracilis gracilis* (Röber)

Plebeius gracilis Röber, 1886 : 67, pl. 5, fig. 1, Ceram.
Nacaduba gerydomaculata Rothschild, 1915 : 139, Central Ceram (Type !), **syn. n.**

(iv) *P. gracilis saturatior* (Rothschild) **stat. n.**

Nacaduba saturatior Rothschild, 1915 : 393, Dampier I. (Type !).

Prosotas elsa (Grose Smith)

(Text-figs. 60 and 61)

Nacaduba elsa Grose Smith, 1895 : 509, Amboina (Type !).

Prosotas dubiosa (Semper)

(i) *P. dubiosa indica* (Evans)

(Text-figs. 53 and 54)

Nacaduba dubiosa indica Evans, 1925 : 613, Ceylon (Type !).

(ii) *P. dubiosa lumpura* (Corbet)

Nacaduba dubiosa lumpura Corbet, 1938 : 141, Malay Pen. (Type !).

(iii) *P. dubiosa subardates* (Piepers & Snellen)

Lycaena ardates subardates Piepers & Snellen, 1918 : 43, Java.
Prosotas dubiosa roepkei Toxopeus, 1929 : 242, Java (**syn. n.**).
Prosotas hybrida Toxopeus, 1929 : 241, Java (**syn. n.**).

The name *subardates* although somewhat fortuitiously included in the literature must stand, and can only apply to the insect figured by Piepers & Snellen (1918, pl. xxi, fig. 58). Toxopeus (1929 : 242) used the name incorrectly for an insect that is most probably *datarica* Snellen.

(iv) *P. dubiosa eborata* **ssp. n.**

(Pl. 2, figs. 10–11)

This Solomon Islands race is in both sexes identical above with specimens from the New Guinea mainland ; beneath, it can be readily recognized by the presence of a wide ivory coloured band on the hind wing which fills the whole of the area between the median band and the submarginal series of lunules. The submarginal spots on this wing are also surrounded by the same pale colour, but in other respects the underside of all wings conforms to the normal *dubiosa* pattern.

Holotype ♂, SOLOMON ISLANDS : N. side of Choiseul I., xii.1903 (*A. S. Meek*), B.M. Type No. Rh. 16595.

Allotype ♀. Data as holotype, B.M. Type No. Rh. 16596.

Other material. SOLOMON ISLANDS : as holotype, 3 ♂ ; Isabel I., vi–viii.1901 (*A. S. Meek*), 6 ♂ ; Bougainville, vi.1904 (*A. S. Meek*), 1 ♂ ; Gela, 1 ♂ ; Guizo,

xi.1903 (*A. S. Meek*), 2 ♀; Guadalcanal, Lunga, 28.ii.1935 (*R. A. Lever*), 1 ♀; Nissan I., viii.1924 (*A. F. Eichhorn*), 1 ♂.

(v) *P. dubiosa dubiosa* (Semper)

Lampides dubiosa Semper, 1879 : 159, Queensland (Type !).

Prosotas caliginosa Druce

(Text-fig. 63)

Prosotas caliginosa Druce, 1891 : 366, pl. 31, fig. 15, Alu I. (Type !).

Prosotas lutea (Martin)

(i) *P. lutea sivoka* (Evans)

Nacaduba sivoka Evans, 1910 : 427, Teesta Valley (Type !).

(ii) *P. lutea lutea* (Martin)

Nacaduba lutea Martin, 1895 : 1, NE. Sumatra (Type !).

Prosotas noreia (Felder)

(i) *P. noreia noreia* (Felder)

(Text-fig. 62)

Lycaena noreia Felder, 1868 : 282, Ceylon.

(ii) *P. noreia hampsonii* (de Niceville)

Nacaduba hampsonii de Niceville, 1885 : 118, pl. 2, fig. 13, Ootacamund.
Lycaenesthes emolus topa Evans, 1912 : 986, Palni Hills (Type !).

(iii) *P. noreia cyclops* Toxopeus

Prosotas noreia cyclops Toxopeus, 1929 : 241, Java.

PARADUBA Bethune-Baker

Paraduba Bethune-Baker, 1906 : 103.
Type-species : *Paraduba owgarra* Bethune-Baker.

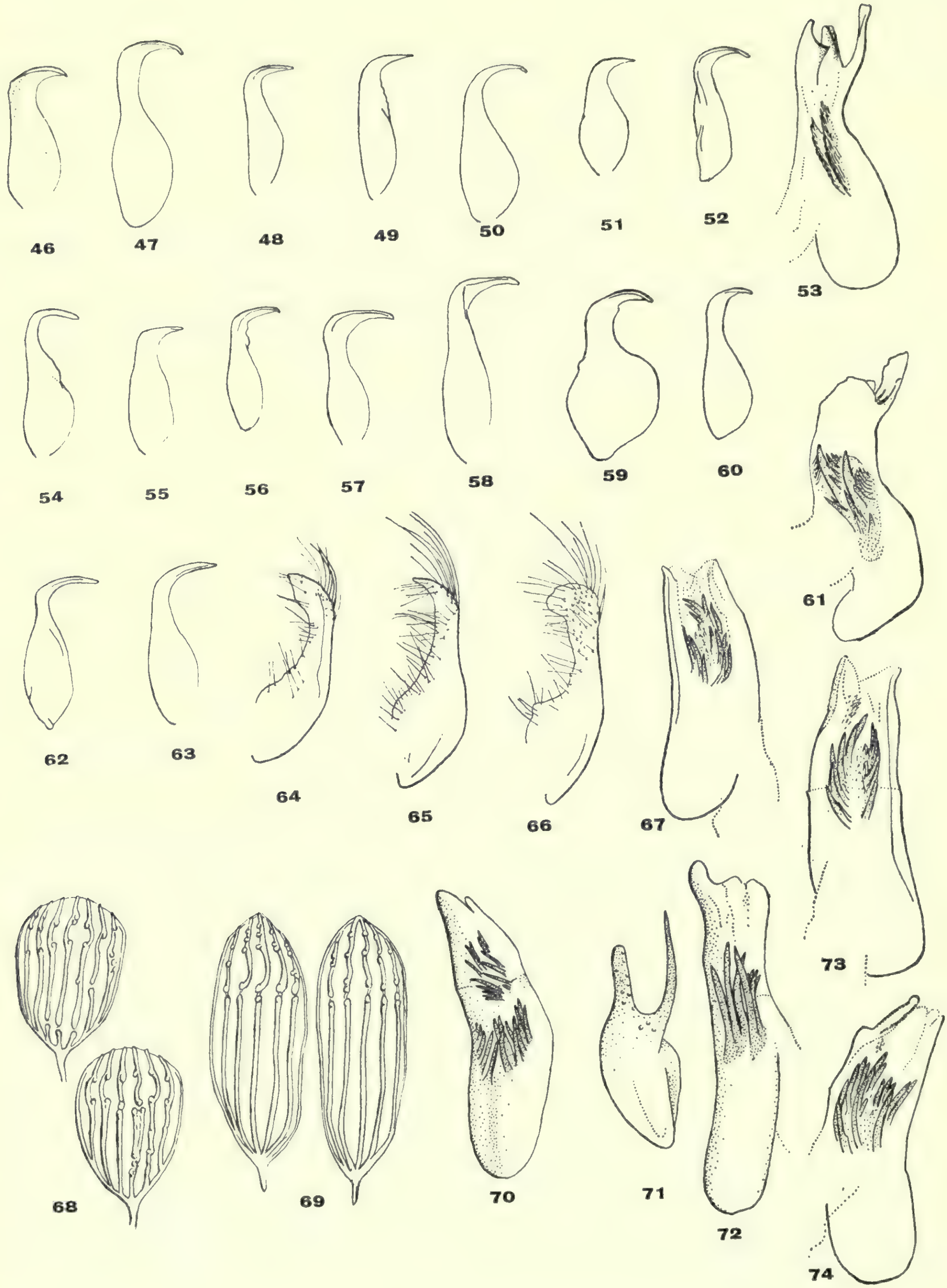
Bethune-Baker distinguished this genus from *Nacaduba* by certain characters of the fore wing venation. Careful examination of the series of *P. owgarra* in the B.M. (N.H.) has failed to confirm all his findings ; certainly the origins of veins 6 and 7 are closer together than those of *Nacaduba*, but the termination of 7, and the courses of 11 and 12, scarcely differ from their counterparts in that genus. Nevertheless, the name *Paraduba* should be retained for the three species *owgarra*, *metriodes* and *siwiensis*, all of which show close affinity with one another in the male genitalic structure, namely the simple clavate densely-haired claspers, and the strongly cornute aedeagi (see Text-figs.).

Paraduba owgarra Bethune-Baker

(Pl. 2, figs. 12–13. Text-figs. 64 and 67)

Paraduba owgarra Bethune-Baker, 1906 : 104, Brit. New Guinea, Owgarra (Type !).

A series of some 30 males and a solitary female are in the B.M. (N.H.) and come from Owgarra, Aroa River, Mambare River and Angabunga River, all in British New Guinea.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The hitherto unknown female can be described as follows. In shape it is like the male, but the wings are rather broader. The fringes are brown with the exception of a white portion—extending from vein 4 to just below the apex on the hind wing. The fore wing is dingy brown above, with a strong intermixture of blue scales at the base of area 1, and a similar intermixture of more whitish scales at the bases of areas 2 and 3. On the dingy brown hind wing, a scattering of blue scales fills the cell, and spreads outwards to the bases of all areas from 1 to 6. The underside only differs from that of the male in the more whitish ground colour of its fore wing.

Neallotype ♀, BRITISH NEW GUINEA : Angabunga River, 6,000 ft., xi–ii.1904–05 (*A. S. Meek*), B.M. Type No. Rh. 16597.

Paraduba metriodes (Bethune-Baker)

(i) *P. metriodes metriodes* (Bethune-Baker)

(Pl. 2, figs. 14–15. Text-figs. 65 and 74)

Nacaduba metriodes Bethune-Baker, 1911 : 452 British New Guinea, Dinawa (Type !).
Nacaduba proxima Rothschild ; Joicey & Talbot, ♀, 1916 : 79, Wandammen Mts. (Neallotype !).

A series in the B.M. (N.H.) come from British New Guinea and Humbolt Bay, Wandammen Mts., Fak Fak, Kapaur, Arfak Mts., Geelvink Bay, in Dutch New Guinea.

The insect referred to by Joicey & Talbot as the female of *proxima* Rothschild is an aberrant male *metriodes metriodes* with a wide dark margin ; its sex has been confirmed by dissection.

(ii) *P. metriodes proxima* (Rothschild) **comb. n.**

(Pl. 2, figs. 16–18)

Nacaduba proxima Rothschild, 1915 : 29, Utakwa R. (Type !).

Represented in the B.M. (N.H.) by a series of 24 males and one female, all are from the Setekwa and Utakwa Rivers in the Snow Mountains, Dutch New Guinea.

On the upperside the males are identical with those of the nominate subspecies, but the darker underside, with bolder and whiter reticulations, make this a quite distinctive race.

The female—so far undescribed—is pale grey-blue above ; which colour gradually merges with the wide fuscous-brown costal margin, and with the even wider distal margin on all wings. The hind wing series of black submarginal spots are bordered outwardly by a series of interneural white lines, and inwardly by a series of pale lunules. The underside is like that of the male.

FIGS. 46–52. ♂, clasper : 46, *Prosotas aluta coelestis* ; 47, *Pr. nelides* ; 48, *Pr. nora ardates* ; 49, *Pr. atra* ; 50, *Pr. talesea* ; 51, *Pr. papuana* ; 52, *Pr. felderi.*
FIG. 53. ♂, aedeagus, *Prosotas dubiosa indica.*
FIGS. 54–60. ♂, clasper : 54, *Prosotas dubiosa indica* ; 55, *Pr. pia pia* ; 56, *Pr. ella* ; 57, *Pr. bhutea* ; 58, *Pr. datarica* ; 59, *Pr. gracilis ni* ; 60, *Pr. elsa.*
Fig. 61. ♂, aedeagus : *Prosotas elsa.*
FIGS. 62–66 ♂, clasper : 62, *Prosotas noreia* ; 63, *Pr. caliginosa* ; 64, *Paraduba owgarra* ; 65, *Pa. metrioides* ; 66, *Pa. siwiensis.*
FIG. 67. ♂, aedeagus : *Paraduba owgarra.*
FIGS. 68–69. ♂, *androconia* : 68, *Ionolyce helicon* ; 69, *I. brunnescens.*
Fig. 70. ♂, aedeagus : *Ionolyce helicon.*
FIG. 71. ♂, clasper : *Ionolyce brunnescens.*
FIGS. 72–74. ♂, aedeagus : 72, *Ionolyce brunnescens* ; 73, *Paraduba siwiensis* ; 74, *Pa. metrioides.*

Neallotype ♀, DUTCH NEW GUINEA: Snow Mts., Upp. Setekwa R., 2–3,000 ft. vii.1910 (*A. S. Meek*), B.M. Type No. Rh. 16598.

Paraduba siwiensis sp. n.

(Pl. 2, fig. 19. Text-figs. 66 and 73)

The colour above, and the shape, are similar to those of *owgarra*, but the dusky margins are much narrower. On the underside, the general pattern is like that of *metriodes*, except that the median spots on the fore wing tend to become confluent, and are proportionately wider, especially those on the hind wing. The tornal spot is enclosed inwardly by a very red prominent lunule. The male clasper is stouter and more club-like than that of either of the two preceding species. Only males are known.

Holotype ♂, DUTCH NEW GUINEA: Arfak Mts., Mt. Siwi, 800 m., 1928 (*Dr. E. Mayr*), B.M. Type No. Rh. 16599.

Other material. As holotype, 11 ♂; Dutch New Guinea, Ninay Valley, 3,500 ft., 1908–09 (*A. E. Pratt*), 3 ♂.

IONOLYCE Toxopeus

Ionolyce Toxopeus, 1929: 236.
Type-species: *Lycaena helicon* Felder.

Apparently the author had intended publishing a diagnosis of this genus in Treubia, for in the original publication he gives "*Ionolyce* Tox. i.l. (Treubia, 1929?)". No description has been traced in this or any other publication. He used the name only for *Lycaena helicon* Felder, and as a monotypical genus the name is valid. The neuration of *helicon* shows little deviation from the usual *Nacaduba* pattern; the anastomosed portion of veins 11 and 12 is longer, and the free end of 12 is very weak. A more definite character is exhibited by the androconia; whereas in many Lycaenids, the ribs on these scales are composed of parallel series of closely placed nodules, those of *Ionolyce* are ribbon-like, with some nodular irregularities, chiefly in the upper third of the scale. The aedeagus is remarkable for the large spine-like cornuti attached to the vesica.

Ionolyce helicon (Felder)

The pointed apex of the fore wing, the obtuse angle at the end of vein 3 of the hind wing, and the dark purple colouring of the male, combine to make this species easy to identify.

(i) *I. helicon viola* (Moore)

Lampides viola Moore, 1877: 340, Ceylon (Type !).

(ii) *I. helicon merguiana* (Moore)

Lycaenesthes merguiana Moore, 1884: 23, Mergui (Type !).

(iii) *I. helicon brunnea* (Evans)

Nacaduba helicon brunnea Evans, 1932: 241, Andamans (Type !).

(iv) *I. helicon kondulana* (Evans)

Nacaduba helicon kondulana Evans, 1932: 241, S. Nicobars, Kondul (Type !).

(v) *I. helicon javanica* Toxopeus

Ionolyce helicon javanica Toxopeus, 1929 : 236, Java.

(vi) *I. helicon helicon* (Felder)

(Text-figs. 68 and 70)

Lycaena helicon Felder, 1860 : 457, Amboina (Type !).
Plebeius unicolor Röber, 1886 : 66, pl. 5, fig. 4, Ceram, Key, and E. Celebes.

(vii) *I. helicon hyllus* (Waterhouse & Lyell) **comb. n.**

Nacaduba hermus hyllus Waterhouse & Lyell, 1914 : 97, figs. 349–351, Cape York.

(viii) *I. helicon caracalla* (Waterhouse & Lyell) **comb. n.**

Nacaduba caracalla Waterhouse & Lyell, 1914 : 95, fig. 854, Darnley Island.

This is almost certainly the name for the New Guinea race of *helicon* ; the description agrees well with the specimens from that island. Waterhouse's figure is reproduced from a painting, and depicts the upper and undersides of the male. The upperside is a good representation of *helicon*, showing the dark purple colour, the pointed fore wing, and the characteristic obtuse angle in the hind wing margin. The figure of the underside is not so accurate ; the median band on the fore wing is too straight, and the general pattern is altogether too vague. However, examination of the figures of *Nacaduba cela* and *N. ios*, on the same plate, reveals similar inaccuracies in each case, obviously these figures cannot be taken at face value. In distinct contrast to all the other races, the female has a large white area in the middle of the fore wing above, recalling that of female *Erysichton lineata*.

Distribution. Waigeu, Mysol, New Guinea, New Britain and New Ireland.

Ionolyce brunnescens sp. n.

(Pl. 2, figs. 1–4. Text-figs. 69, 71 and 72)

The apex of the fore wing is less produced than that of *helicon*, and the distal margin of the hind wing is not angled at vein three. Different conditions of light refraction produce a gloss of either purple or green on the brownish upperside. In the female, a large blue fascia on the fore wing occupies the basal halves of areas 1b to 3, and a small part of the base of area 4 ; the portion of this fascia above vein 2 takes on an almost chalky tone ; in other respects the upperside is like that of female *helicon*. Beneath in the male, the submarginal spots are clearly ringed with white, and the adjoining dark lunules are followed on the hind wing by a broad white band, which fills the region between them and the median spots ; there is no trace of orange or yellow in the tornal area. The female underside is like that of the male, but the white band is continued on the fore wing, although there it is somewhat marred by brown smudges between the veins. The fore wing measures 15–16 mm. in both sexes. In contrast to the preceding species, the androconia are long, narrow, and leaf-like in shape ; they have only five ribbon-like ribs. The genitalia differ by the great length of the ventral spine on the valve, the conical lobe on the distal margin of that organ, and by the great size, and smaller number of cornuti on the vesica.

Holotype ♂, SOLOMON ISLANDS : Isabel I., vi–vii.1901 (*A. S. Meek*), B.M. Type No. Rh. 16600.

Allotype ♀, SOLOMON ISLANDS : Guizo I., xi.1903 (*A. S. Meek*), B.M. Type No. Rh. 16601.

Other material. As holotype, 1 ♂.

ERYSICHTON Fruhstorfer

Nacaduba artengruppe *Erysichton* Fruhstorfer, 1916 : 137 [as subgenus, Fruhstorfer, 1916 : 107].
Type-species : *Lycaena lineata* Murray. (By present designation.)

Fruhstorfer used this name to distinguish those species of the group that do not possess falces on the uncus ; he included under this head *Nacaduba palmyra* Felder with many subspecies, together with references to the original descriptions, *N. fatureus* Röber and *N. hyperesia* Fruhstorfer. His descriptions and genitalia figures make it clear that he was mistaken in his identifications ; his *palmyra palmyra* is not the insect described by Felder, but is conspecific with *L. lineata* Murray, while his *hyperesia* is in fact the true *palmyra* Felder. *Lycaena lineata* is treated by Fruhstorfer (1916 : 139) as a subspecies of *palmyra*. As *Erysichton* is here used as a genus, and to avoid confusion, I hereby select *Lycaena lineata* Murray as the type of the genus.

Erysichton lineata (Murray)

All races of this species can be at once distinguished from those of *E. palmyra* by their unspotted fringes, the paler grey-blue colour of the males, and in both sexes by the absence of the whitish submarginal areas so characteristic of Felder's species on the underside. The androconia are very distinctive ; they are long and narrow, shaped rather like a paddle with a blade at each end, similar to those of *Petrelaea dana*, but quite twice as large.

(i) *E. lineata cythora* (Fruhstorfer) **comb. n.**

Nacaduba palmyra cythora Fruhstorfer, 1916 : 137, Batjan (Type !), **syn. n.**
Nacaduba palmyra eugenea Fruhstorfer, 1916 : 137, Obi (Type !), **syn. n.**
Nacaduba valentina Grose Smith, 1895 : 508, Amboina (♀ nec. ♂), (Allotype !), **syn. n.**

Darker on the under surface than Papuan *lineata* ; the males being a rich sooty brown. The white patch on the fore wing of the female is restricted.

The series from Batjan and Obi do not differ externally, and as far as can be seen from the few examples available, neither do specimens from Ceram, Amboina and Tenimber.

Distribution. Batjan, Obi, Ceram, Amboina, Buru and Tenimber.

(ii) *E. lineata meiranganus* (Röber) **comb. n.**

Plebeius meiranganus Röber, 1886 : 65, Aru.
Plebeius fatureus Röber, 1886 : 66, Aru, **syn. n.**
Nacaduba palmyra vaneeckei Fruhstorfer, 1916 : 138, Snow Mts. (Type !), **syn. n.**
Nacaduba palmyra thadmor Fruhstorfer, 1916 : 138, New Guinea, Vulcan, Dampier, **syn. n.**

Distribution. Aru, Key, New Guinea, Dampier, Vulcan and Admiralty Is.

(iii) *E. lineata insularis* **ssp. n.**

The upperside in both sexes does not differ materially from that of the foregoing race, but the tornal orange lunule on the underside of the hind wing is always larger, and is often more than twice the width of that of the New Guinea insect. The white markings in the disc and the submarginal region of the underside in the female are purer brighter white, making the whole pattern stand out more clearly than in any other race.

Holotype ♂, LOUISIADE ARCHIPELAGO : Sudest I., Mt. Riu, 2,000 ft., vi.1916 (*Eichhorn Bros.*), B.M. Type No. Rh. 16602.

Allotype ♀ as holotype, B.M. Type No. Rh. 16603.

Distribution. Trobriand Islands, D'Entrecasteau and Louisiade Archipelagos.

(iv) *E. lineata uluensis* (Ribbe) **comb. n.**

Nacaduba meiranganus var. *uluensis* Ribbe, 1899 : 230, pl. 4, fig. 6, Neu Pommern.

Compared with the preceding races, the male is of a purer grey-blue tone above. The female has all the dark portions of the wings of a more greyish hue, the white area on the fore wing is restricted as is that of *cythora*, and the basal blue on the hind wing extends well beyond the end of the cell before merging into the grey distal area. Beneath in both sexes, the orange tornal lunule is small like that of *meiranganus*.

Distribution. New Britain, New Ireland, New Hanover, French Islands, St. Matthias and Squally Islands.

(v) *E. lineata vincula* (Druce) **comb. n.**

Nacaduba vincula Druce, 1891 : 363, pl. 31, fig. 18, Solomons (Type !).

Recognizable in the male by the very wide median band on the fore wing beneath, and in the female by the small white areas of the fore wing on the upperside, and the reduction of the basal blue on all wings, which gives the insect a rather drab appearance.

Distribution. Solomon Islands : Guadalcanar, Guizo, San Christobal, New Georgia, Bougainville, Isobel, Gela, Kulambranga and Fauro.

(vi) *E. lineata lineata* (Murray) **stat. n.**

(Text-figs. 76, 77, 84, 85)

Lycaena lineata Murray, 1874 : 524, pl. 10, fig. 9, Queensland.

The female has a bigger white patch on the fore wing than in any other race.

Distribution. Queensland.

Erysichton palmyra (Felder).

The androconia are of the normal battledore shape, and have 16 to 17 ribs. The male claspers are short, oval in shape, and furnished at the apex with an inwardly directed point.

(i) *E. palmyra tasmanicus* (Miskin) **stat. n.**

Lycaena tasmanicus Miskin, 1890 : 40, Tasmania (sic.).
Lycaena elaborata Lucas, 1900 : 137, Brisbane, **syn. n.**

The underside in both sexes is warm reddish brown. A series of nine males from Tenimber also exhibit this character.

Distribution. Queensland, Tenimber.

(ii) *E. palmyra palmyra* (Felder)

(Text-figs. 75 and 83)

Lycaena palmyra Felder, 1860 : 458, Amboina (Type !).
Nacaduba valentina Grose Smith, 1895 : 508, Amboina (♂ nec. ♀), (Type !), **syn. n.**
Nacaduba poecilta Holland, 1900 : 74, Buru, **syn. n.**
Nacaduba hyperesia Fruhstorfer, 1916 : 139, Obi (Type !).

The sooty brown underside in the male readily distinguishes this from the Australian race. Only three females (from Ceram) are available ; they are pale grey beneath, with a much more regular arrangement of the dark banding.

Distribution. Amboina, Ceram, Batchian, Obi, Mefor I. and Biak.

(iii) *E. palmyra coelia* (Grose Smith)

Nacaduba coelia Grose Smith, 1894 : 573, Humbolt Bay (Type !).
Nacaduba subvariegata Rothschild, 1915 : 392, Vulcan I. (Type !), **syn. n.**

In the male fore wing above, the marginal band is much wider than in the other races ; it increases in width towards the apex, where it attains a width of from 2 to 3 mm. Beneath, the general appearance is like that of the nominate race, but the distal area in all wings is more extensively washed with white. The female is similar to that sex of the nominate race, but its underside markings are darker.

Distribution. Aru, Waigeu and New Guinea.

(iv) *E. palmyra clara* **ssp. n.**
(Pl. 2, figs. 20–21)

The male is larger than that of any other race ; it measures 17 mm. from base to apex of the fore wing. Above, the colour is clear grey-blue, clearer and brighter than in *p. palmyra*, and the fringes are only lightly checkered at the vein ends. Beneath, very dark blackish brown, it is without any whitish washing in the distal area.

Holotype ♂, BISMARCK ARCHIPELAGO: New Britain, Talesea, ii.1925 (*A. F. Eichhorn*), B.M. Type No. Rh. 16604.

(v) *E. palmyra lateplaga* **ssp. n.**
(Pl. 2, fig. 22)

Two male specimens from the Solomon Islands suggest a parallel development with *E. lineata vincula*, also from that area. Like that insect, they display on the underside a marked widening of the median band, a greater development of the orange tornal lunule on the hind wing, and a less produced, less acute apex of the fore wing, than is found in the other races. As far as can be ascertained from the rather tattered material, the colour above, and the fringes, are like those of the nominate race. Beneath, as well as the differences mentioned, the distal whitening is reduced to the edging of the submarginal spots and lunules.

Holotype ♂, SOLOMON ISLANDS : Florida I., i.1901 (*Meek*), B.M. Type No. Rh. 16605.

Other material. Rubiana I., 1 ♂.

***Erysichton albiplaga* sp. n.**
(Pl. 2, figs. 5–8)

Genitalically no difference can be found between this species and *E. palmyra*, but in view of the great divergence in external characters it is deemed advisable to treat them as distinct species.

The male is similar in shape to *palmyra* ; its upperside is blue-lavender of sufficient transparency to allow the white transverse band on the underside to show through on all wings. On the secondaries, a double black submarginal spot in cellule 1 is followed inwardly by a dusky patch ; there is a larger single spot in cellule 2, and indications of submarginal spots appear faintly in all cellules to the apex ; these spots are bordered outwardly by pale interneural lines. All wings are bordered by a fine dark marginal line. The female is shining blue at the base of all wings ; this colour extends on the fore wing over the lower half of the discoidal cell, just reaches the base of area 2, and covers the basal $\frac{1}{3}$ of area 1. On the hind wing, its clearly defined outer edge runs in an almost straight line from the costa, through the points of origin of veins 7 and 2, to the hind margin. Then follows a broad white band, reaching from area 5 on the fore wing to the hind margin on the hind wing. On the fore wing, a black costal

band extends into the upper half of the cell, and to the apex, where it meets a wide marginal band of at least 4 mm. A similar marginal band on the hind wing is suffused inwardly with whitish blue scales where it meets the distal edge of the white band. Blue encircled dark spots appear in areas 1 to 3, and are faintly indicated in areas 4 to 6. The fringes in both sexes are white, checkered with fuscous at the vein-ends. Beneath the male is sooty brown, prominently marked with a wide white transverse band, which extends from just below the fore wing costa to the hind margin on the hind wing; it is 3 mm. at its greatest width, but tapers towards both extremities. Two undulating fine white lines traverse the cell of the fore wing; the outer line is continued across both wings. A more definite whitish line borders the inner edge of the discoidal lunule. Beyond the broad white band is a median band of spots, darker than the ground, and finely outlined with white on their convex distal edges. A series of submarginal spots is bordered internally by a corresponding series of heavy dark lunules; both series are finely margined with white. The tornal spot on the hind wing is black, flecked with metallic green scales, and narrowly edged inwardly with golden yellow. The spot in cellule one is similar but smaller. The fringes are spotted as on the upperside. In the female, the pattern is basically the same, but the white band extends to 5 mm.

Holotype ♂, BISMARCK ARCHIPELAGO: New Hanover, ii–iii.1923 (*A. S. Meek*), B.M. Type No. Rh. 16606.

Allotype ♀, as Holotype, B.M. Type No. Rh. 16607.

CATOPYROPS Toxopeus

Catopyrops Toxopeus, 1930 : 146.
Type-species : *Lycaena ancyra* Felder.

Toxopeus included *rita* Grose Smith and *florinda* Butler, as subspecies of *ancyra*. Eliot 1956 : 37 pointed out the specific distinctness of *rita*, and there can be no doubt that *florinda*, with its subspecies *estrella* Waterhouse, and the new subspecies described below, constitute a third species. Reference to the genitalia figures should be sufficient to substantiate this. *C. keiria* Druce and *C. kokopona* Ribbe both exhibit divergent genitalia, and it is with some hesitation that they are included in the genus.

Catopyrops ancyra (Felder)

(i) *C. ancyra aberrans* (Elwes)

Nacaduba aberrans Elwes, 1892 : 626, pl. 44, fig. 6, E. Pegu (Type !).

(ii) *C. ancyra almora* (Druce)

Cupido almora Druce, 1873 : 349, pl. 32, fig. 7, Borneo (Type !).
Nacaduba pseustis Doherty, 1891 : 182, Borneo.

(iii) *C. ancyra hyperpseustis* (Toxopeus)

Nacaduba ancyra hyperpseustis Toxopeus, 1929 : 210, Pulo Weh.

(iv) *C. ancyra exponens* (Fruhstorfer)

Nacaduba ancyra exponens Fruhstorfer, 1916 : 124, "Cocos Inseln (Holl. Klappereiland)."

(v) *C. ancyra nicevillei* Toxopeus

Catopyrops ancyra nicevillei Toxopeus, 1930 : 147, pl. 4, fig. 2, NE. Sumatra.

(vi) *C. ancyra austrojavana* Toxopeus

Catopyrops ancyra austrojavana Toxopeus, 1930 : 147, pl. 4, fig. 5, a–b–c, E. Java.

(vii) *C. ancyra subfestivus* (Röber)

Plebeius subfestivus Röber, 1886 : 64, pl. 4, fig. 33, Aru, Ceram, Celebes (part).
Nacaduba ancyra subfestivus Röber ; Fruhstorfer, 1916 : 123, Celebes (part).
Catopyrops ancyra duplicata Toxopeus, 1930 : 149, pl. 4, fig. 13a–b, Kalawara, Centr. Celebes.

Fruhstorfer restricted this name to the Celebes race with grey-brown underside and dark markings ; he also mentioned other examples with whitish undersides and red-brown markings, the latter would almost certainly be what has since been described as *C. rita bora* by Col. Eliot. Toxopeus also had both species ; he treated *bora* as *ancyra subfestivus* and gave true *subfestivus* the name *duplicata*.

(viii) *C. ancyra ancyra* (Felder)

(Text-figs. 78 and 87)

Lycaena ancyra Felder, 1860 : 457, Amboina (Type !).

(ix) *C. ancyra tuala* Toxopeus

Catopyrops ancyra tuala Toxopeus, 1930 : 148, pl. 4, fig. 10, Toeal, Key.

(x) *C. ancyra mysia* (Waterhouse & Lyell)

Nacaduba ancyra mysia Waterhouse & Lyell, 1914 : 96, Prince of Wales Island.
Nacaduba ancyra vanheurni v. Eecke, 1924 : 41, Dutch New Guinea.

(xi) *C. ancyra complicata* (Butler)

Lampides complicata Butler, 1882 : 150, Duke of York Island (Type !).

(xii) *C. ancyra procella* **ssp. n.**

(Pl. 1, fig. 21)

This subspecies is remarkable for the pale silver-grey tone of the underside, which is only equalled by that of *C. ancyra ligamenta* Druce from the other end of the Solomon chain ; it contrasts strongly with the brown colour to be found on that surface of *C. ancyra complicata* and *C. ancyra amaura*. Above, the male does not differ from these races. The female is pale shining grey-blue on all wings ; the dusky marginal areas of the fore wing are somewhat restricted, and the submarginal series of spots and lunules on the hind wing are fine, but clearly marked ; the orange crescent in area 2 is obsolescent. Beneath, the brown-grey markings are all reduced in width, and the orange crescent, though present, is considerably reduced. Length of fore wing : male 13–14 mm. ; female 11–14 mm.

Holotype ♂, Bismarck Archipelago : Squally Island (1° 40′ S., 150° 30′ E.), viii.1923 (*A. F. Eichhorn*), B.M. Type No. Rh. 16608.

Allotype ♀, as holotype, B.M. Type No. Rh. 16609.

Other material. As holotype, 2 ♂.

(xiii) *C. ancyra distincta* **ssp. n.**

(Pl. 1, fig. 22)

At once recognizable in both sexes by the appearance of the underside, in which the grey-brown markings are all sharply delineated on a silvery white ground. Not distinguishable from *amaura* on the upper surface.

Holotype ♂, Solomon Islands : Nissan Island (4° 30′ S., 154° 20′ E.), vii–ix.1924 (*A. F. Eichhorn*), B.M. Type No. Rh. 16610.

Allotype ♀, as holotype, B.M. Type No. Rh. 16611.

Other material. As holotype, 2 ♂.

(xiv) *C. ancyra amaura* (Druce)

Nacaduba amaura Druce, 1891 : 361, pl. 31, fig. 10, Alu, Rubiana, and Malaita (Type !).

(xv) *C. ancyra maniana* (Druce)

Nacaduba maniana Druce, 1891 : 361, pl. 31, fig. 9, Ulaua I. (Type !).

(xvi) *C. ancyra ligamenta* (Druce)

Nacaduba ligamenta Druce, 1891 : 361, pl. 31, figs. 11–12, Ugi I. (Type !).

Catopyrops rita (Grose Smith)

(i) *C. rita bora* Eliot

Catopyrops rita bora Eliot, 1956 : 37, S. Celebes (Type !).

(ii) *C. rita altijavana* Toxopeus **comb. n.**

Catopyrops ancyra (*subfestivus*) *altijavana* Toxopeus, 1930 : 148, Java (Malang.).

(iii) *C. rita rita* (Grose Smith)

(Text-figs. 79 and 89)

Nacaduba rita Grose Smith, 1895 : 508, Wetter (Type !).

Catopyrops florinda (Butler)

(i) *C. florinda florinda* (Butler)

(Text-figs. 81 and 88)

Lampides florinda Butler, 1877 : 354, Lifu (Type !).

(ii) *C. florinda estrella* (Waterhouse & Lyell) **comb. n.**

Nacaduba ancyra estrella Waterhouse & Lyell, 1914 : 96, fig. 312, Cooktown.
Nacaduba ancyra *halys* Waterhouse, 1934 : 416, New South Wales, **syn. n.**

(iii) *C. florinda parva* **ssp. n.**

This insular dwarf race from Timor and some nearby islands is consistently smaller than *estrella* or the nominate race ; its fore wing only extends in length to from 10 to 12 mm., and its apex is less pointed. In the male, the dark margins of all wings are fine ; the tornal spot on the hind wing is small, and the orange lunule is reduced or absent. The only female exhibits a marked extension of the purple-blue ground colour ; this extends from the base, over the cell, and over all the discal area below vein 6, and as far as the submarginal lunules on all wings. A dusky smear closes the cell on each wing, and the median bands can be seen shining through from below. The costal regions and the submarginal markings are fuscous ; the latter are clearly marked on the hind wings, but are only indicated on the fore wings. Beneath in both sexes, the pattern is similar to that of the nominate race, but less emphasized. Superficially this subspecies bears considerable resemblance to *C. ancyra tuala*, but the male genitalia are of the characteristic *florinda* pattern, with a long and curved extension on the clasper.

Holotype ♂, TIMOR : Oinainisa, xi–xii.1892 (*W. Doherty*), B.M. Type No. Rh. 16612.

Allotype ♀, as holotype, B.M. Type No. Rh. 16613.

Other material. TIMOR : Atapupu, viii.1897 (*Everett*), 2 ♂ ; as holotype, 1 ♂ ; Dili, v.1892 (*Doherty*), 1 ♂. SOUTH WEST ISLANDS : Moa I., xii.1902 (*Kuhn*), 9 ♂ ; Kisser I. (*Kuhn*), 2 ♂ ; Wetter I., v.1892, 2 ♂.

Catopyrops keiria (Druce)

(Text-figs. 80 and 91)

Nacaduba keiria Druce, 1891 : 362, pl. 31, figs. 13–14, Solomons (Type!).

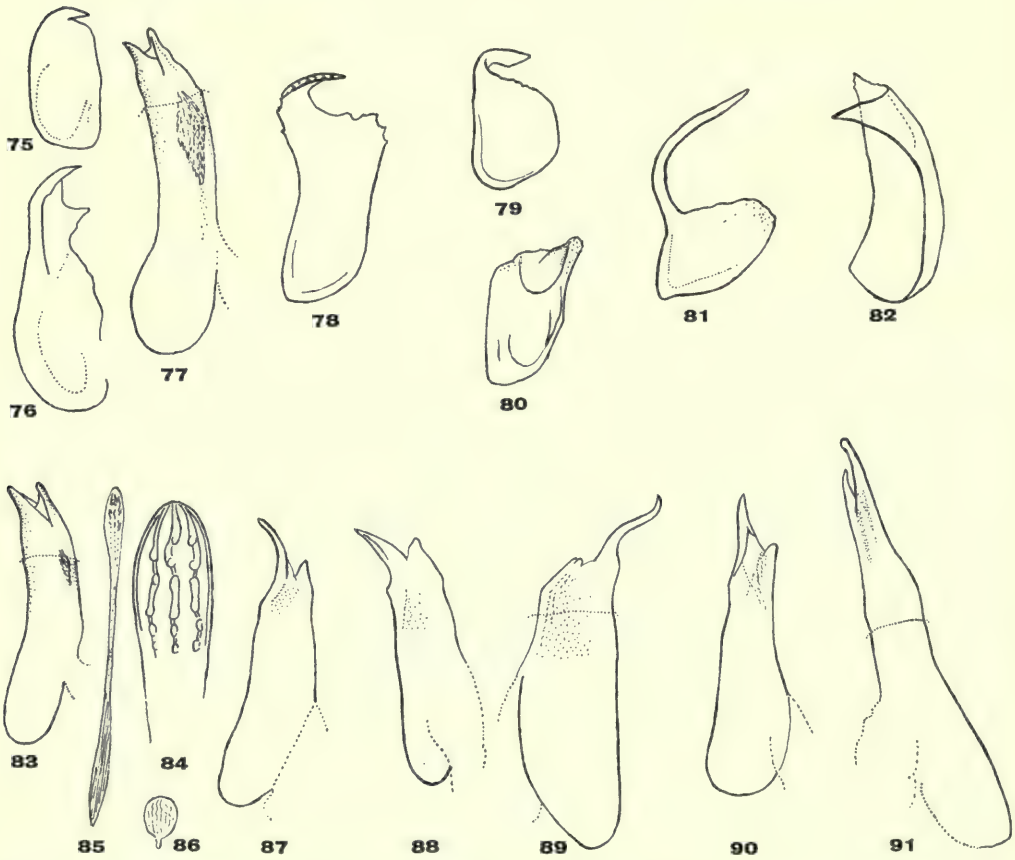
Catopyrops kokopona (Ribbe) comb. n.

(Text-figs. 82 and 90)

Nacaduba kokopona Ribbe, 1899 : 232, pl. 4, fig. 7, Neu Pommern.

PETRELAEA Toxopeus

Petrelaea Toxopeus, 1929 : 242.
Type-species : *Nacaduba dana* de Niceville.



FIGS. 75–76. ♂, clasper : 75, *Erysichton palmyra* ; 76, *E. lineata.*
FIG. 77. ♂, aedeagus : *Erysichton lineata.*
FIGS. 78–82. ♂, clasper : 78, *Catopyrops ancyra* ; 79, *C. rita* ; 80, *C. keiria* ; 81, *C. florinda* ; 82, *C. kokopona.*
FIG. 83. ♂, aedeagus : *Erysichton palmyra.*
FIGS. 84–86. ♂, *androconia* : 84, 85, *Erysichton lineata* ; 86, *Ionolyce helicon* (same scale as 85).
FIGS. 87–91. ♂, aedeagi : 87, *Catopyrops ancyra* ; 88, *C. florinda* ; 89, *C. rita* ; 90, *C. kokopona* ; 91, *C. keiria.*

Petrelaea dana (de Niceville)

(Text-figs. 18 and 45)

Nacaduba dana de Niceville, 1883 : 73, pl. 1, fig. 15, Bhutan.
Plebeius tombugensis Röber, 1886 : 63, E. Celebes.
Lycaena ardeola Staudinger, 1889 : 97, Palawan.
Nacaduba obscura Grose Smith, 1894 : 574, Humbolt Bay (Type !).
Nacaduba ardates var. *dima* Rhé Philipe, 1911 : 764, Naga Hills (Type !).
Nacaduba ios Waterhouse & Lyell, 1914 : 99, figs. 856–857, Thursday Island.
Nacaduba subdubiosa Rothschild, 1915 : 29, Utakwa R. (Type !).
Petrelaea dana varia Toxopeus, 1929 : 242, Java.

The unique structure of the male organs of this species confirms the action of Toxopeus in separating *Petrelaea* from *Nacaduba*. In spite of the wide range of the species—India, Burma, Malaysia, to New Guinea and the Solomons—it has not been found possible to define any geographical races or subspecies, and so the various names that have been put forward are listed as synonyms.

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INDEX

(Synonyms are in italics.)

PLATE 1

FIG. 1. *Nacaduba mallicollo markira*, ♂ upperside, B.M. (N.H.) Neg. No. 30280.

FIG. 2. *Nacaduba mallicollo markira*, ♂ underside, B.M. (N.H.) Neg. No. 30281.

FIG. 3. *N. mioswara*, ♂ underside, B.M. (N.H.) Neg. No. 30301.

FIG. 4. *N. novaehebridensis vulcana*, ♂ underside, B.M. (N.H.) Neg. No. 30300.

FIG. 5. *N. novaehebridensis guizoensis*, ♂ underside, B.M. (N.H.) Neg. No. 30302.

FIG. 6. *N. lucana*, ♂ underside, B.M. (N.H.) Neg. No. 30305.

FIG. 7. *N. lucana*, ♀ upperside, B.M. (N.H.) Neg. No. 30282.

FIG. 8. *N. lucana*, ♀ underside, B.M. (N.H.) Neg. No. 30283.

FIG. 9. *N. cajetani*, ♂ underside, B.M. (N.H.) Neg. No. 30303.

FIG. 10. *Prosotas atra*, ♂ upperside, B.M. (N.H.) Neg. No. 30286.

FIG. 11. *P. atra*, ♂ underside, B.M. (N.H.) Neg. No. 30287.

FIG. 12. *P. talesea*, ♂ upperside, B.M. (N.H.) Neg. No. 30288.

FIG. 13. *P. talesea*, ♂ underside, B.M. (N.H.) Neg. No. 30289.

FIG. 14. *P. papuana*, ♂ upperside, B.M. (N.H.) Neg. No. 30290.

FIG. 15. *P. papuana*, ♂ underside, B.M. (N.H.) Neg. No. 30291.

FIG. 16. *P. pia marginata*, ♂ upperside, B.M. (N.H.) Neg. No. 30292.

FIG. 17. *P. pia marginata*, ♂ underside, B.M. (N.H.) Neg. No. 30293.

FIG. 18. *P. pia pia*, ♂ upperside, B.M. (N.H.) Neg. No. 30294.

FIG. 19. *Nacaduba ruficirca*, ♂ upperside, B.M. (N.H.) Neg. No. 30284.

FIG. 20. *N. ruficirca*, ♂ underside, B.M. (N.H.) Neg. No. 30285.

FIG. 21. *Catopyrops ancyra procella*, ♂ underside, B.M. (N.H.) Neg. No. 30308.

FIG. 22. *C. ancyra distincta*, ♂ underside, B.M. (N.H.) Neg. No. 30309.

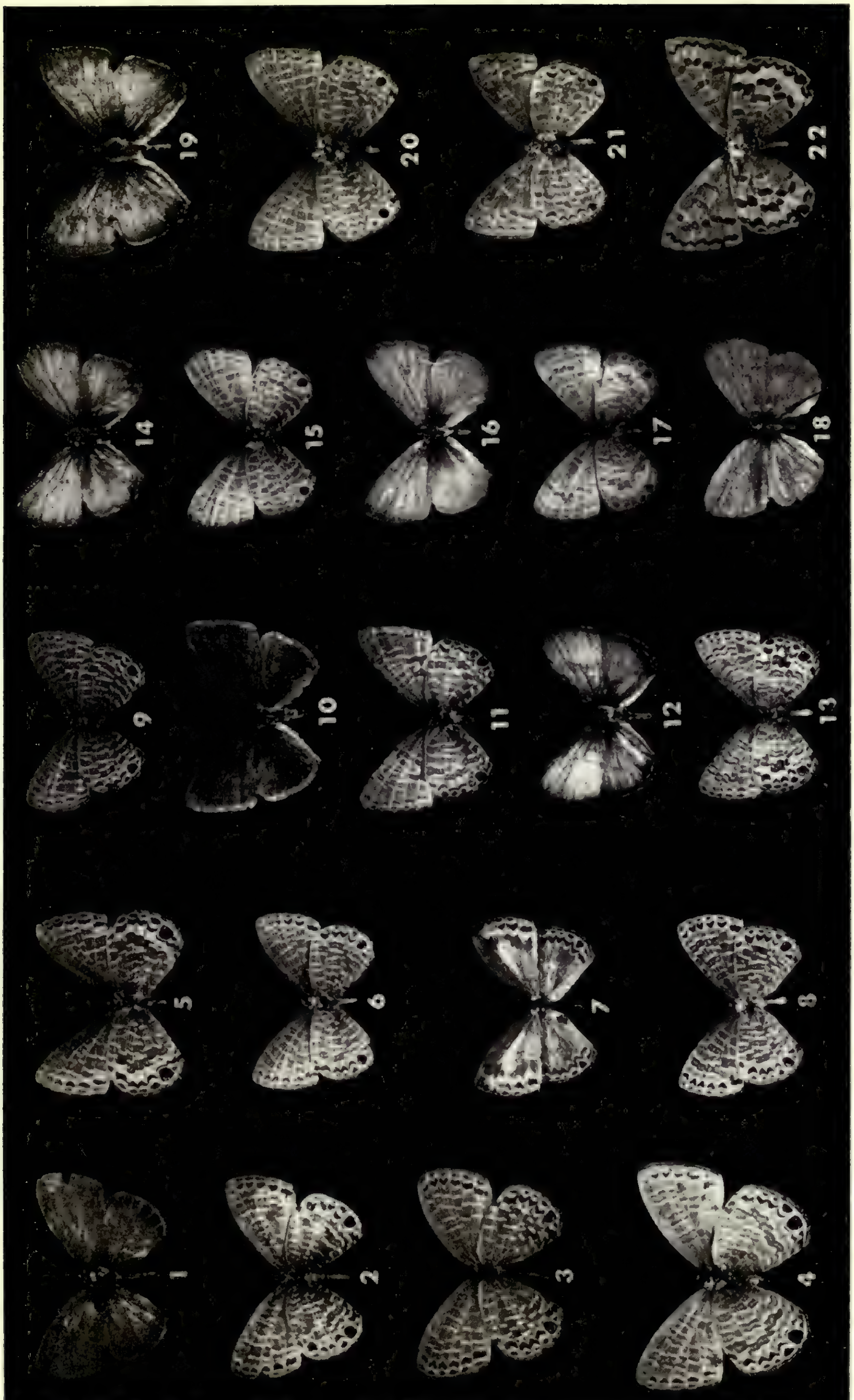
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PLATE 2

FIG. 1. *Ionolyce brunnescens*, ♂ upperside, B.M. (N.H.) Neg. No. 30268.

FIG. 2. *I. brunnescens*, ♂ underside, B.M. (N.H.) Neg. No. 30269.

FIG. 3. *I. brunnescens*, ♀ upperside, B.M. (N.H.) Neg. No. 30270.

FIG. 4. *I. brunnescens*, ♀ underside, B.M. (N.H.) Neg. No. 30271.

FIG. 5. *Erysichton albiplaga*, ♂ upperside, B.M. (N.H.) Neg. No. 30276.

FIG. 6. *E. albiplaga*, ♂ underside, B.M. (N.H.) Neg. No. 30277.

FIG. 7. *E. albiplaga*, ♀ upperside, B.M. (N.H.) Neg. No. 30278.

FIG. 8. *E. albiplaga*, ♀ underside, B.M. (N.H.) Neg. No. 30279.

FIG. 9. *Prosotas pia pia*, ♂ underside, B.M. (N.H.) Neg. No. 30295.

FIG. 10. *P. dubiosa eborata*, ♂ upperside, B.M. (N.H.) Neg. No. 30296.

FIG. 11. *P. dubiosa eborata*, ♂ underside, B.M. (N.H.) Neg. No. 30297.

FIG. 12. *Paraduba owgarra*, ♂ upperside, B.M. (N.H.) Neg. No. 30298.

FIG. 13. *P. owgarra*, ♂ underside, B.M. (N.H.) Neg. No. 30297.

FIG. 14. *P. metriodes metriodes*, ♂ upperside, B.M. (N.H.) Neg. No. 30272.

FIG. 15. *P. metriodes metriodes*, ♂ underside, B.M. (N.H.) Neg. No. 30273.

FIG. 16. *P. metriodes proxima*, ♂ underside, B.M. (N.H.) Neg. No. 30304.

FIG. 17. *P. metriodes proxima*, ♀ upperside, B.M. (N.H.) Neg. No. 30274.

FIG. 18. *P. metriodes proxima*, ♀ underside, B.M. (N.H.) Neg. No. 30275.

FIG. 19. *P. siwiensis*, ♂ underside, B.M. (N.H.) Neg. No. 30306.

FIG. 20. *Erysichton palmyra clara*, ♂ upperside, B.M. (N.H.) Neg. No. 30266.

FIG. 21. *E. palmyra clara*, ♂ underside, B.M. (N.H.) Neg. No. 30267.

FIG. 22. *E. palmyra lateplaga*, ♂ underside, B.M. (N.H.) Neg. No. 30307.


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ON THE TRICHOPTERA OF ETHIOPIA

D. E. KIMMINS

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 13 No. 5
LONDON : 1963

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BY

D. E. KIMMINS

British Museum (Natural History)

Pp. 117–170 ; 139 *Text-figures*

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ON THE TRICHOPTERA OF ETHIOPIA

By D. E. KIMMINS

SYNOPSIS

A study of collections made by Dr. A. Tjønneland and others has resulted in raising the number of species recorded from Ethiopia to fifty-one, of which seventeen are here described as new. The genus *Hydropsychodes* Ulmer has been placed as a synonym of *Cheumatopsyche* Wallengren.

UNTIL Dr. A. Tjønneland began collecting with the aid of a mercury vapour light trap, the trichopteran fauna of Ethiopia was almost unknown. A selection of his catches, together with collections made by two of his colleagues and by Mr. Bob G. Hill in the Dire Dawa district, form the subject of this study. They have increased the number of species recorded to fifty-one, of which seventeen are here described as new.

Despite this considerable addition to the known fauna, much of the country is still unworked and it is probable that further representatives of families of Trichoptera which occur elsewhere in Africa remain to be discovered. These include the Rhyacophilidae, Philopotamidae, Polycentropodidae, Hydroptilidae, Calamoceratidae, Leptoceridae and Lepidostomatidae.

Of the species now known to occur in Ethiopia, eleven are found also in East Africa, seven extend into West Africa and five are widespread African species. One species was originally described from SW. Arabian material and another is closely allied to a species from that area.

The author wishes to express his thanks to Dr. A. Tjønneland, of University College of Addis Ababa, for the opportunity of working on this collection and for allowing the British Museum (Natural History) to retain most of it, including the holotypes and allotypes. Paratypes, where available, and named duplicates have been returned to the University College of Addis Ababa. Dr. Tjønneland has also made collections of Ephemeroptera in Ethiopia, which it is hoped to deal with in due course.

In the present paper, to save space, in recording localities the word ETHIOPIA has been omitted. In indicating the location of types and paratypes, the abbreviations (BMNH) and (UCAA) have been used for the British Museum (Natural History) and the University College of Addis Ababa respectively.

Family PHILOPOTAMIDAE

Chimarra abyssinica Banks

Chimarrha abyssinica Banks, 1913 : 235, (♀) ; Ulmer, 1930 : 479–482, figs. 1–3, (♂).

Gamo Province, Gughé Highlands, Bonghé, c. 9,000 ft., 29.xii.1948, from foliage of willows and flood refuse by stream in flat valley, 1 ♂, 1 ♀ ; Chencha, c. 8,900 ft.,

30.xi.1948, from springs full of water plants in valley NE. of camp, 1 ♀ (*H. Scott*); Dire Dawa district, 5,000–8,000 ft., 2 ♂, 1 ♀ (*B. G. Hill*).

Previous known distribution: ETHIOPIA.

Chimarra lejea Mosely

Chimarrha lejea Mosely, 1948: 75–76, figs. 17–22.

Wondo Abella, warm stream, 24.iv.1960, 1 ♂, 1 ♀ (*A. Tjønneland*).

Previous distribution: WESTERN ADEN PROTECTORATE and YEMEN.

Dr. Tjønneland also collected some *Chimarra* larvae at the same locality, which may possibly belong to this species.

Chimarra triangularis sp. n.

(Text-figs. 1–6)

(In alcohol.) Head, pronotum and patagia yellow (possibly orange in life) with golden hairs and a few black setae above the eyes. On the vertex is a fuscous triangle, apex forward, the angles at the ocelli. Antennae fuscous, with faint, paler annulations. Palpi pale fuscous. Meso- and metathorax fuscous, paler at the sides, mesoscutellar warts yellowish brown. Legs fuscous, posterior femora with a paler area beneath. Tibial spurs 1.4.4. Abdomen pale fuscous, terminal segments darker.

Wings pale fuscous, with fuscous pubescence. In fore wing with small hyaline areas surrounding the *r–m* and *m* cross-veins, the base of the median cell and the arculus. Veins otherwise fuscous. *Rs* distinctly sinuous before discoidal cell, which is subquadrangular. In hind wing, *Rs* is complete.

♂ GENITALIA. Eighth segment more strongly pigmented than preceding ones. Ninth with a strong, laterally compressed, triangular ventral process arising from the apical ventral margin. Side-pieces broadly triangular. Dorsum of ninth segment largely membranous, apart from a basal rib. Tenth tergite forming a pair of convex, lateral plates, about as long as the claspers, and partly enclosing the aedeagus on either side. In side view, each tapers to a rounded apex and from the upper margin arises a slender, digitate process, directed caudad. On each side of the tenth tergite, at the base, is a small, clavate cercus, set with setae. Aedeagus cylindrical, arising from a stout base, filled with membrane and enclosing two pairs of hooks or spines, and two single ones. Claspers in ventral view caliper-like, outer surfaces convex, inner hollowed, tapering to short, truncate apices. There is a short, internal branch at the base of each clasper.

♀ GENITALIA. Seventh sternite with a small, acute ventral process. Eighth segment synscleritous, apical margins blackened and serrate, ventral margins somewhat produced. Ninth tergite and sternite lightly sclerotized, the tergite with long, slender apodemes. Tenth tergite small.

Length of fore wing, ♂, 5·25 mm., ♀, 6·5 mm.

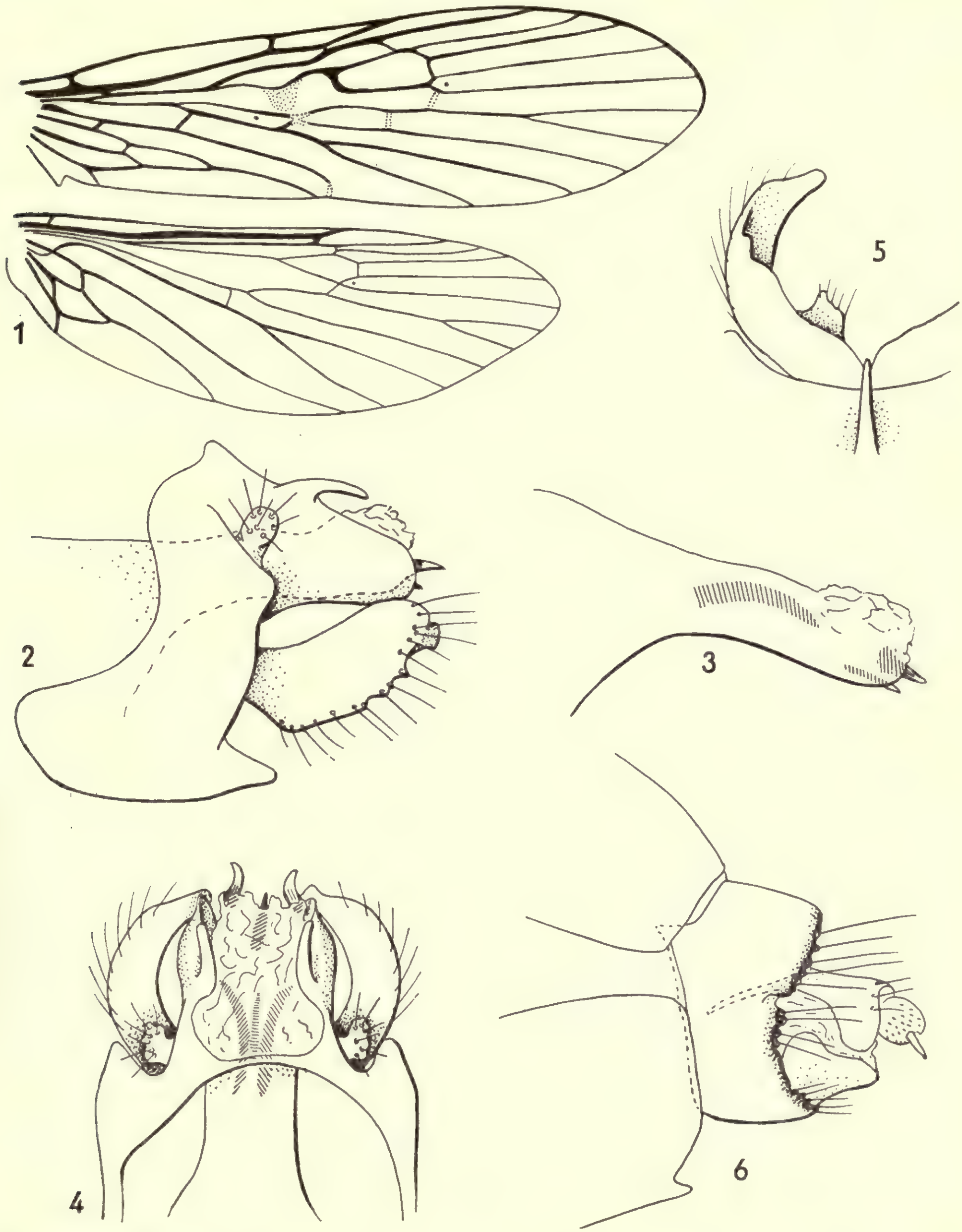
Holotype ♂, Gojeb River, 10.iv.1961 (*G. Hodera*), BMNH, mounted as microscope preparations.

Allotype ♀, Gojeb River, 10.iv.1961 (*G. Hodera*), BMNH, in 2% formaldehyde solution, abdomen mounted as microscope preparation.

Paratypes, Gojeb River, 10.iv.1961, 2 ♂, 12 ♀ (*G. Hodera*); stream near Gofa village, 15 km. from Adolla, 14.iv.1961, 17 ♂, 10 ♀; ?Sokorro stream, Wodorro village, 22–23.iv.1961, 1 ♀ (*A. Tjønneland*), BMNH, UCAA.

This species is related to *C. rhodesi* Kimmins (S. Rhodesia) in the general pattern of the male genitalia. It differs in the more developed tenth tergite, which more

fully encloses the stem of the aedeagus and in the dorsal processes of the tergite. The claspers are stouter in side view and have a stronger inner branch. There is no ventral process on the eighth segment in the male.



FIGS. 1–6. *Chimarra triangularis* sp. n. 1, ♂ wings; 2–6, genitalia; 2, ♂ lateral; 3, ♂ aedeagus, lateral; 4, ♂ dorsal; 5, ♂ left clasper, ventral; 6, ♀ genitalia, lateral.

Family **POLYCENTROPODIDAE**

Dipseudopsis capensis Walker

Gofa village, 15 km. S. of Adolla, 17.iv.1960, 1 ♂; near Lake Shala, 25.iv.1960, 1 ♀; Koka Dam, 29.iii.1961, 3 ♂; Lake Margherita, 8–9.iv.1961, numerous ♂, ♀ (*A. Tjønneland*).

Widely distributed in Africa.

Family **PSYCHOMYIIDAE**

Subfamily **ECNOMINAE**

Ecnomus thomasseti Mosely

Ecnomus thomasseti Mosely, Kimmins, 1957a : 266, fig. 2, T.

Lake Awasa, 6, 27.xi.1960; Lake Langano, 7.iv.1961; Lake Margherita, 8–9.iv.1961 (*A. Tjønneland*).

This widely distributed African species was taken in small numbers.

Ecnomus ugandanus Kimmins

Kimmins, 1957a : 263, fig. 2, U.

Lake Awasa, 6, 27.xi.1960, small numbers; Koka Dam, 29.iii.1961, 7 ♂ (*A. Tjønneland*).

Previous distribution: UGANDA, TANGANYIKA.

Ecnomus hilli **sp. n.**

(Text-figs. 7–11)

(In alcohol.) Spurs 3.4.4. Head fuscous, with piceous pubescence. Antennae pale brownish, basally finely annulated with fuscous. Palpi dark fuscous. Thorax dark reddish brown, sides paler. Legs fuscous, anterior paler. Wings fuscous, with dark reddish brown pubescence. R_1 in fore wing forked. Abdomen pale fuscous, terminal segments darker.

♂ GENITALIA. Lobes of tenth segment moderately elongate, tapering slightly towards the truncate apices in side view, with rounded angles. Internal black teeth forming a group about midway along upper margin. Basal process short, stout, slightly curved. Aedeagus long, stout about midway in side view, then tapering to a fine, spiniform apex. On its upper surface, at the widest part, arises a short, bifurcate process, directed caudad. Clasper about as long as lobe of tenth tergite, in side view about half as deep as sternite at its base, dilating to about midway and then tapering to a rounded apex. From beneath, the clasper is wide basally, its inner ventral margin semicircularly excised in apical half to form a caliper-like process.

♀ GENITALIA. Eighth sternite divided almost to its base to form two quadrate, lateral plates, the sternite between them reduced to a shallow, rounded lobe. The lateral plates are a little longer than eighth tergite, extending about to apex of ninth tergite.

Length of fore wing, ♂, ♀, 7 mm.

Holotype ♂, Dire Dawa district, 5,000–8,000 ft., 1961 (*B. G. Hill*), BMNH, mounted as microscope preparations.

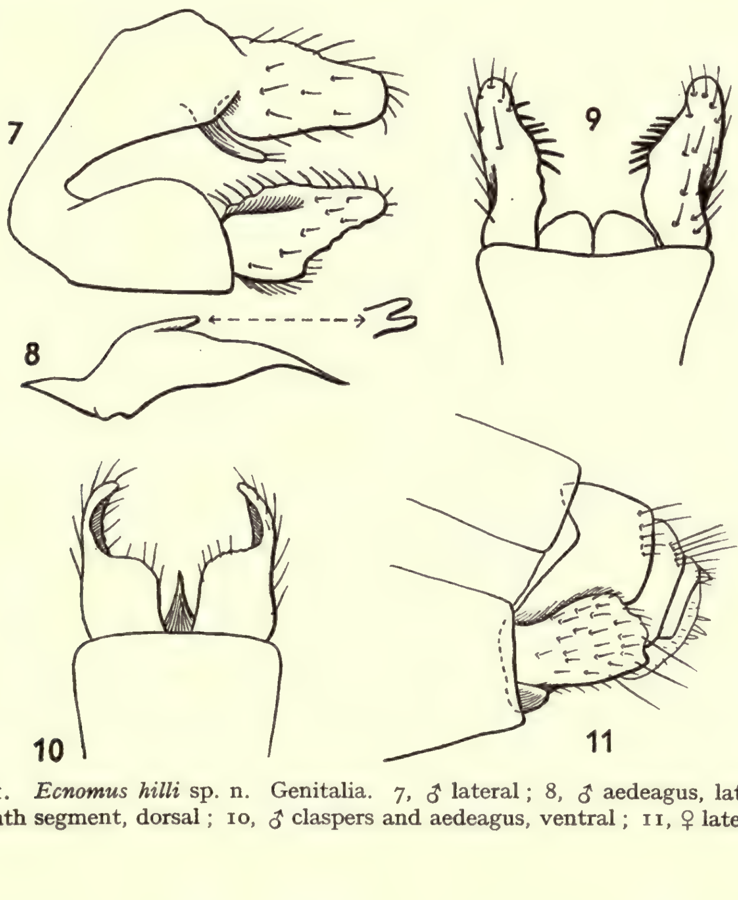
Allotype ♀, Dire Dawa district, 5,000–8,000 ft., 1961 (*B. G. Hill*), BMNH, in 2% formaldehyde solution, abdomen mounted as microscope preparation.

Paratypes, Dire Dawa district, 5,000–8,000 ft., 1961, 16 ♂, 13 ♀ (*B. G. Hill*), BMNH and UCAA.

In male genitalia, this species resembles *E. katangae* Jacquemart in having short basal processes to the lobes of the tenth segment and a slender, somewhat sinuous aedeagus without titillators (unless the bifurcate process can be considered as fused titillators). It differs in the shape of the lobe of the tenth segment, and lacks the " coral process " on that segment. Jacquemart does not indicate any dorsal process on the aedeagus. The claspers are shorter and stouter than in *katangae*. Jacquemart does not show the radius in the anterior wing forked at its apex, but this fork is sometimes somewhat obscure. The female is only provisionally associated with the male.

Ecnomus similis Mosely

Koka Dam, 29.iii.1961, 9 ♂ (*A. Tjønneland*).
Previous distribution : S. AFRICA, NYASALAND.



FIGS. 7–11. *Ecnomus hilli* sp. n. Genitalia. 7, ♂ lateral ; 8, ♂ aedeagus, lateral ; 9, ♂ tenth segment, dorsal ; 10, ♂ claspers and aedeagus, ventral ; 11, ♀ lateral.

Ecnomus sp.

Lake Awasa, 6.xi.1960, 1 ♂ (*A. Tjønneland*).

This male is freshly emerged and lacking in pigmentation. From the male genitalia, it appears to be an undescribed species related to *E. hilli* sp. n., but in view of the limited material it is not proposed to give it a name.

Ecnomus spp. ♀♀

Lake Awasa, 6.xi.1960, numerous ex.; Koka Dam, 29.iii.1961, numerous ex. (*A. Tjønneland*).

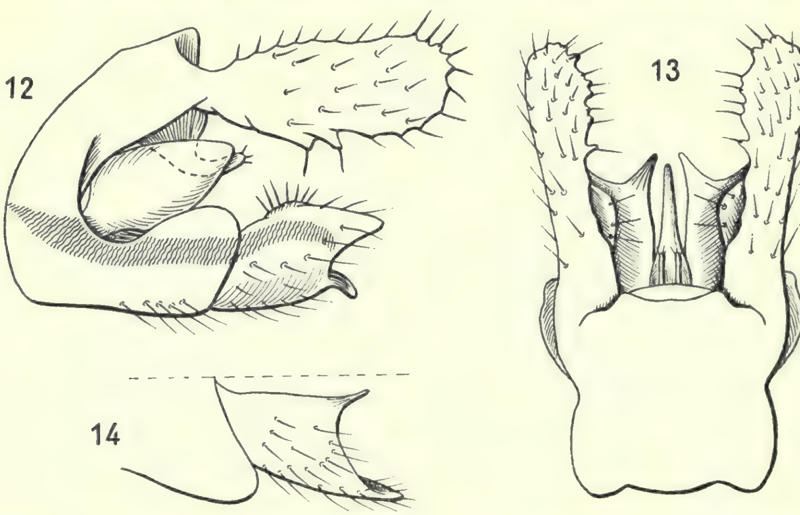
In the absence of definitely associated males, the *Ecnomus* females are left undetermined.

Psychomyiellodes excavata sp. n.

(Text-figs. 12–14)

♂ (in alcohol). Head pale fuscous, warts darker, pubescence piceous. Basal segment of antennae fuscous, remaining segments ochraceous, with sparse fuscous pubescence. Palpi fuscous. Thorax fuscous above, ochraceous on sides and beneath. Legs ochraceous, tibiae and tarsi darker or obscured by fuscous pubescence, posterior femora with a sub-basal, fuscous ring. Inner apical spur of hind tibia with apical claw. Wings pale fuscous, with fuscous pubescence. Venation typical of genus.

♂ GENITALIA. Ninth segment with a deep lateral excision. Dorsal apical margin slightly produced at its centre, tenth segment excised to its base to form a pair of long, flattened processes, concave internally. From the side, each process is constricted basally, upper margin sinuous, lower with one or two tooth-like projections about midway, apex rounded. From above, the upper dorsal margin is also somewhat serrate. The inner, digitate process is rather short, directed downwards and then caudad, terminating in about three setae. Aedeagus



FIGS. 12–14. *Psychomyiellodes excavata* sp. n. ♂ Genitalia. 12, lateral; 13, dorsal; 14, right clasper, ventral.

slender, sinuous in side view, very slender apically in dorsal aspect. On each side, situated in the lateral excision of the ninth segment, is the usual scoop-like process or titillator. Clasper single-segmented, its apical margin more deeply excavated than in *P. obscura*, ovate rather than triangular in side view, and with the produced, inner apical angle appearing as a down-turned hook.

Length of fore wing, ♂, 3·5 mm.

Holotype ♂, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

This species comes nearest to *P. obscura* Kimmins, from which it may be distinguished by the different shape of the tenth segment, the more curved digitate processes and the different shapes of the ninth sternite and claspers.

Psychomyiellodes obscura Kimmins

Kimmins, 1957a : 270, figs. 1, D, 4.

Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 1 ♂ (*A. Tjønneland*).

Previous distribution : UGANDA, RHODESIA.

A single Ecnomine female from the same locality is placed as a *Psychomyiellodes*, since no *Ecnomus* were taken at the same time. I do not know of any reliable characters by which to separate the females of these two genera.

Subfamily **PSYCHOMYIINAE**

Abaria electa Marlier

Marlier, 1960 : 85.

Wolamo Prov., Mt. Damota, over 10,000 ft., 5.xi.1948, from moss on wet rock-face of spring, 2 ♂ (*H. Scott*).

These specimens agree in venation and genital structure better with *A. electa* than with *A. tripunctata* Mosely (Aden and Yemen). Both species are, however, very closely related and further material may prove that they are at most only of sub-specific rank.

Previous distribution : CONGO.

Family **HYDROPSYCHIDAE**

Subfamily **OESTROPSINAE**

Amphipsyche senegalensis (Brauer)

For references see Kimmins, 1962 : 85.

Koka Dam, 29.iii.1961 ; Lake Margherita, 8–9.iv.1961 ; Dawa River, 12 km. N. of Hudat, 12.iv.1961 (*A. Tjønneland*).

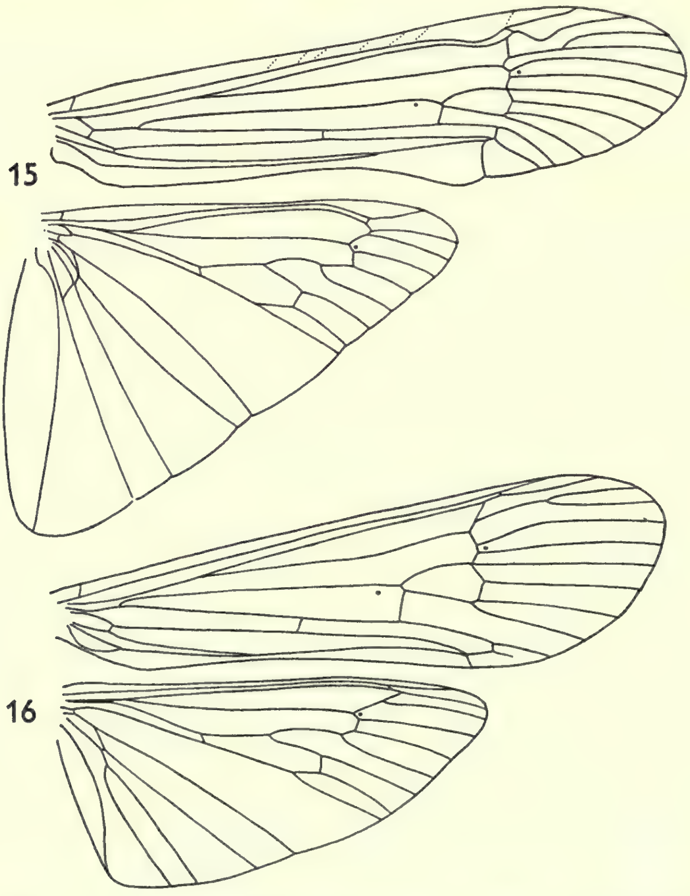
Females from Koka Dam show a variation in the spur formula of the median tibiae, the pre-apical spurs being small or absent. Thus the spur formula may be 0.4.2, 0.3.2 or 0.2.2.

Amphipsyche instabilis sp. n.

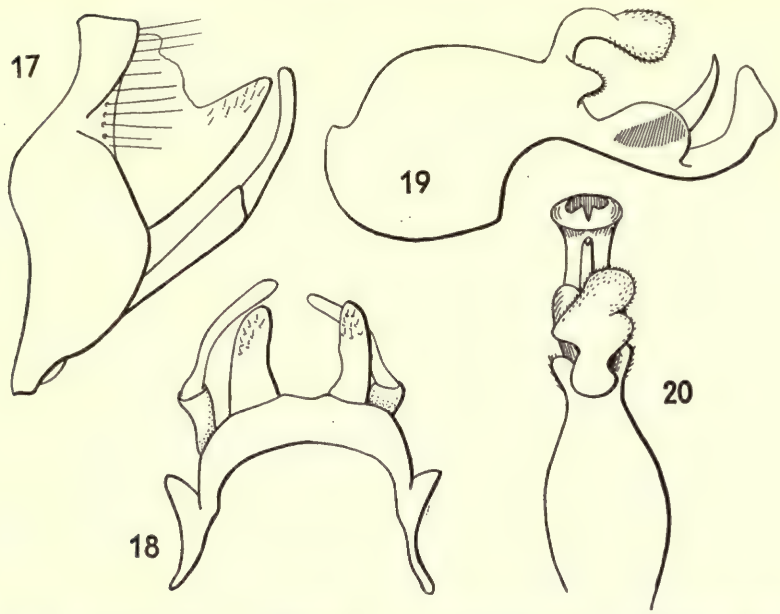
(Text-figs. 15–23)

♂ (in alcohol). General colour of head and thorax tawny yellow, abdomen paler, faintly marked with purplish. Antennae pale luteous basally, narrowly annulated with reddish at the articulations, the segments becoming progressively more shaded with fuscous towards the apices. Palpi and legs luteous, tibial spurs 0.4.2. Fore wing pale tawny yellow, veins pale, venation resembling that of *A. berneri* Kimmins, but the apex of the wing is less dilated and the apical cells consequently narrower. Hind wing hyaline, very wide at base. The venation in the apical part of the wing is somewhat unstable, the cross-vein linking R_5 and M_1 sometimes incomplete or absent; veins R_4 and M_{3+4} are also sometimes incomplete. There is also an additional cross-vein linking M_{3+4} with Cu_{1a} in all the specimens examined, as in the type species, *Amphipsyche proluta* McLachlan. Cell R_{2+3} is sessile.

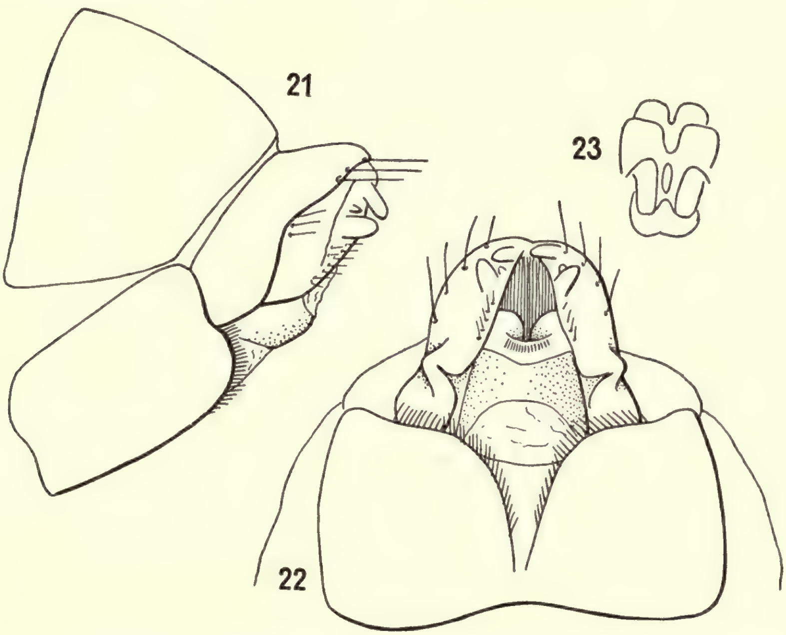
♂ GENITALIA in general appearance not easily distinguished from other species in the genus. The aedeagus is however very distinctive. At about midway along the dorsal surface arises a somewhat clavate process, its short, slender stem directed upwards, the flattened, irregularly-shaped apex bent apically at right angles and clothed with minute, tooth-like rugosity. The



FIGS. 15–16. *Amphipsyche instabilis* sp. n. Wings. 15, ♂; 16, ♀.



FIGS. 17–20. *Amphipsyche instabilis* sp. n. ♂ Genitalia. 17, lateral; 18, dorsal; 19, aedeagus, lateral; 20, the same, dorsal.



FIGS. 21–23. *Amphipsyche instabilis* sp. n. ♀ Genitalia. 21, lateral; 22, ventral; 23, vaginal structure, ventral.

shape of the apex varies in individuals. On each side of this process, at its base, is a small, rounded lobe, similarly rugose. Beyond this dorsal process the aedeagus is slender, its sides produced upwards in rounded, incurved lobes on each side of the parameres. In this species, the two parameres are fused into a single, curved median spine.

♀ (in alcohol). The solitary female is associated with the males chiefly upon the presence of the cross-veins linking M_{3+4} with Cu_{1a} in the hind wing. It is similarly coloured, but with much shorter wings. In the fore wing, *Rs* is slightly sinuous.

♀ GENITALIA. Lobes of eighth sternite moderately long, plate-like, their inner apical angles in ventral view broadly rounded, inner margins almost meeting basally. Ninth tergite forming a short hood, clasper groove inconspicuous. Ninth sternite forming a lightly pigmented, transverse plate, its apex shallowly excised.

Length of fore wing, ♂, 12·5 mm., ♀ 9 mm.

Holotype ♂, Dawa River, 12 km. N. of Hudat, 12.iv.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Dawa River, 12 km. N. of Hudat, 12.iv.1961 (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, one pair of wings and abdomen mounted as microscope preparations.

Paratypes, Dawa River, 12 km. N. of Hudat, 12.iv.1961, 34 ♂ (*A. Tjønneland*), BMNH, UCAA. N. RHODESIA, Zambezi, Katambora, x.1960, 2 ♂, iv.1962, 10 ♂ (*Nat. Mus. S. Rhodesia*), BMNH, NAT. MUS. S. RHOD.

This species somewhat resembles *A. berneri* Kimmins (1962 : 91) from Ghana, but may be distinguished in the males by the dorsal process on the stem of the aedeagus and by the parameres fused to form a single spine. Both sexes are distinguished from other described African species by the cross-vein linking M_{3+4} and Cu_{1a} in the hind wing.

Amphipsyche fuscata sp. n.

(Text-figs. 24–29)

♂ (in alcohol). Head and thorax tawny yellow. Antennae at bases luteous, fairly rapidly shading into fuscous, segments annulated with reddish at articulations. Palpi and legs luteous, tibial spurs 0.4.2. Abdomen creamy, with faint purplish markings. Fore wing mainly hyaline, with pale luteous veins. In well-marked specimens there is a distinct fuscous cloud at apex of median cell and base of cell Cu_{1a} and a band of fuscous between the posterior margin and the anal vein. R_{2+3} is fairly widely separated from R_4, and *Rs* is straight or slightly sinuous towards its apex. Hind wing hyaline, veins pale, apical cell R_2 sessile.

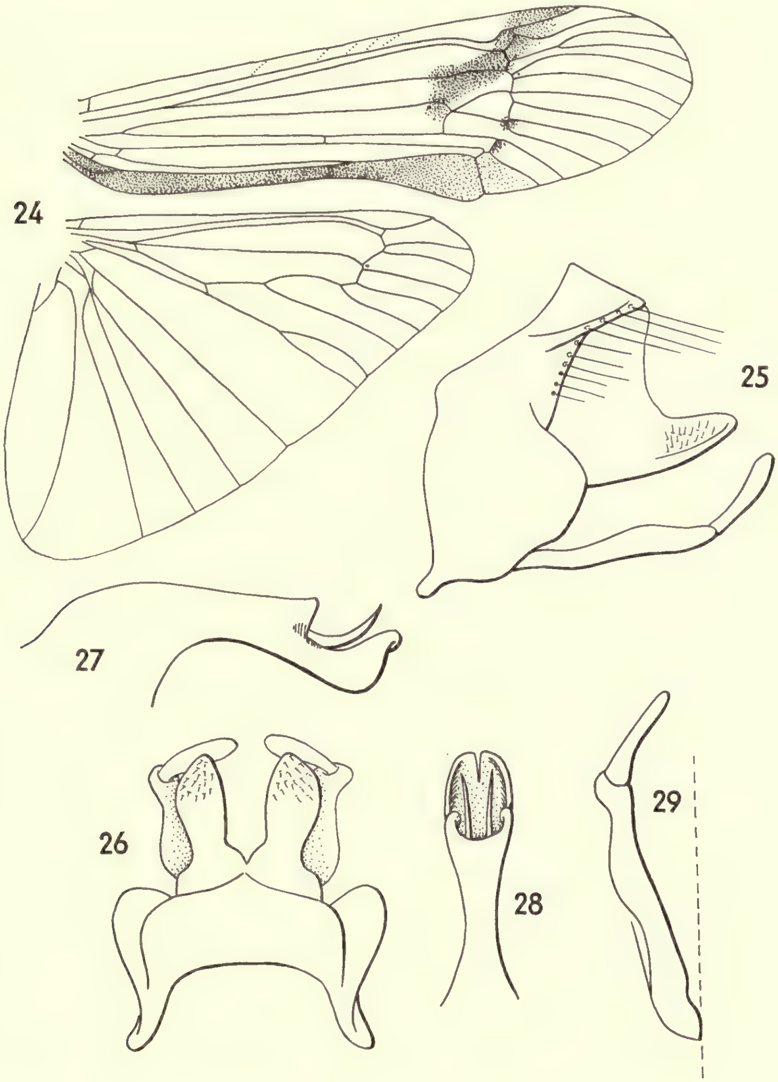
♂ GENITALIA. Ninth tergite slightly produced at the centre of its apical margin. Lobes of tenth segment moderately upturned, flattened, in dorsal view with a deep excision between them almost to the base. Each lobe is widest at about two-thirds from its base, constricted near the base and tapering to a rounded apex. Aedeagus with two slender, upcurved, spiniform parameres, slightly divergent in dorsal view. In side view, the aedeagus is narrowed near the base by a vertical excision of the dorsal margin, which then sweeps up to a rounded apex. Ventral margin convexly rounded before apex. From above, the apical margin is rounded, with a narrow, median excision. Clasper in ventral view with basal segment dilated beyond middle, then constricted and finally becoming clavate apically.

Length of fore wing, ♂, 17 mm.

Holotype ♂, Koka Dam, 29.iii.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Paratypes, Koka Dam, 29.iii.1961, 4 ♂; Dawa River, 12 km. N. of Hudat, 12.iv.1961, 4 ♂; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, numerous ♂ (*A. Tjønneland*), BMNH, UCAA.

This species somewhat resembles *A. corbeti* Kimmins (1962 : 89), but the lobes of the tenth segment are more clavate in dorsal view, the aedeagus is more slender and the parameres are smaller. The basal segment of the clasper is sinuous and more dilated in ventral view. The amount of pattern on the fore wing of *A. fuscata* is subject to variation and some examples have the wings almost unmarked.



FIGS. 24–29. *Amphipsyche fuscata* sp. n. 24, ♂ wings; 25–29, ♂ genitalia; 25, lateral; 26, dorsal; 27, aedeagus, lateral; 28, the same, dorsal; 29, left clasper, ventral.

Subfamily **HYDROPSYCHINAE**

THE GENERA *CHEUMATOPSYCHE* WALLENGREN AND *HYDROPSYCHODES* ULMER

Ulmer (1951 : 224–226) has discussed the status of these two genera at some length and, in dealing with the fauna of the Sunda Islands, he decided to keep the two genera separate, whilst admitting that they were closely related. He used the presence of fork R_2 in the hind wing, the form of the tenth tergite of the male and certain larval differences to distinguish *Cheumatopsyche* from *Hydropsychodes*, in which fork R_2 is wanting in the hind wing. Dr. Ulmer is far better qualified than the writer to assess the value of the larval characters he mentions, but one needs to know the larvae of many more species to be sure of the constancy of these characters.

In the type-species of *Cheumatopsyche* (*Hydropsyche lepida* Pictet), fork R_2 in the hind wing varies in size and may be completely absent. The form of the tenth tergite in the male does not appear to me to be so very different from that of some of the African species (*falcifera* Ulmer, for example), which was placed by Ulmer in his genus *Hydropsychodes* on the absence of fork R_2 in the hind wing. It is admitted that the typical species of *Hydropsychodes* (*Hydropsychodes albomaculata* Ulmer) is of very different general appearance from *Ch. lepida* (Pictet), the wings being dark, with white markings, and the median cell is generally open in the fore wing. Ulmer himself (in a letter to Mosely in 1935) drew attention to the fact that this cell was erroneously shown as closed in his original description (1905 : 34. fig. 22), and this open cell is confirmed by a paratype of *C. albomaculata* (Ulmer), The open median cell of the fore wing cannot, however, be considered as a stable generic character, since Jacquemart (1957 : fig. 84) shows a closed median cell in *albomaculata* and the open median cell is a variable character in another species (*Ch. simplex* **sp. n.**). The male genitalia of *albomaculata* are extraordinarily like those of *Ch. lesnei* (Mosely), which has a closed median cell in the yellowish brown, irrorated fore wings.

We are thus left with no really reliable adult characters by which to separate these two genera, and I am therefore placing *Hydropsychodes* Ulmer in the synonymy of *Cheumatopsyche* Wallengren.

CHEUMATOPSYCHE Wallengren

Cheumatopsyche Wallengren, 1891 : 142. Type species (monobasic), *Hydropsyche lepida* Pictet, 1834.

Hydropsychodes Ulmer, 1905 : 34, **syn. n.** Type species (by designation of Mosely, 1939 : 27), *Hydropsychodes albomaculata* Ulmer, 1905.

Ulmeria Navás, 1918 : 15. Type species (by original designation), *Hydropsyche lepida* Pictet, 1834.

Second segment of maxillary palpus usually cylindrical, but sometimes triangularly dilated, third segment as long as, or longer than, the fourth. Spurs 2.4.4, sometimes 0.4.4 in male. Median leg of female dilated. In fore wing, Cu_2 and $1A$ end separately

in the wing margin and the cross-veins *m-cu* and *cu* are situated close together. In the hind wing, the median cell is open, the veins *M* and *Cu* are widely separated and the cross-vein between them is obvious. Fork R_2 sometimes present but usually absent.

As a result of the amalgamation of these two genera, the species *Hydropsychodes varius* Kimmins (1955 : 391), from Sarawak, becomes a homonym of *Cheumatopsyche varia* (Rambur, 1842) and is renamed *Cheumatopsyche dulitensis* **nom. n.**

Cheumatopsyche stigma Kimmins (1955 : 390), also from Sarawak, is a somewhat aberrant member of the genus as regards venation. In the fore wing, Cu_1 and $1A$ fuse shortly before the wing margin, and in the hind wing the discoidal cell is open. Should more species be found having similar venation, it may be necessary to separate them generically, but for the present, *Ch. stigma* Kimmins is retained as an aberrant species of *Cheumatopsyche.*

Cheumatopsyche sexfasciata (Ulmer) **comb. n.**

(Text-figs. 30–34)

Hydropsyche sexfasciata Ulmer, 1904 : 421, figs. 10–12.
Hydropsychodes sexfasciata (Ulmer) Ulmer, 1905 : 35.

Koka Dam, 29.iii.1961 ; Dawa River, 12 km. N. of Hudat, 12.iv.1961 ; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*) ; Ghibe River, 260 km. from Addis Ababa, 6.v.1961 (*S. Chojnacky*).

There are long series from most of the above localities of what I believe to be Ulmer's *C. sexfasciata.* The types were collected in Cameroons and there are examples from Sierra Leone in the British Museum (Nat. Hist.), determined by M. E. Mosely. As Ulmer's figures were made from dried material, new figures of the wings, of the male and female genitalia and new descriptions of the latter are given, based upon the Ethiopian material.

♂ GENITALIA. Ninth segment with its apical dorsal margin produced in two rounded, setigerous lobes, with a slightly convex excision between them. Side-pieces bluntly triangular. Tenth segment fused to ninth, forming a short hood. In dorsal view, the lateral margins taper slightly and the apical angles are triangularly produced, their apices clavate and finely dentate. Apical margin between them slightly produced and truncate. On each side of the dorsal surface of the tenth segment is a small, rounded, setigerous callus. Aedeagus broad at base, tapering towards the apex, only slightly curved, apex carrying a pair of rounded, incurved lateral lobes, concave internally and concealing a pair of opposing teeth. Clasper slender, slightly sinuous, basal segment with a wide base in ventral view and with a slightly clavate apex. Terminal segment much thinner than basal, upcurved in side view, sinuous in ventral view.

♀ GENITALIA. Reticulated areas present on fourth abdominal pleurites. Apical margin of eighth tergite in side view produced in a shallow, rounded lobe on each side. Clasper receptacle of ninth segment with a very narrow opening, inner part of receptacle curved apically. Clasper groove short and straight.

The sinuous, slender apical segment of the male clasper and the presence of reticulated areas on the fourth pleurite of the female suggest an affinity with *C. afra* (Mosely).

Cheumatopsyche bimaculata (Ulmer) comb. n.

(Text-fig. 35)

Hydropsychodes bimaculata Ulmer, 1930 : 491, fig. 15.

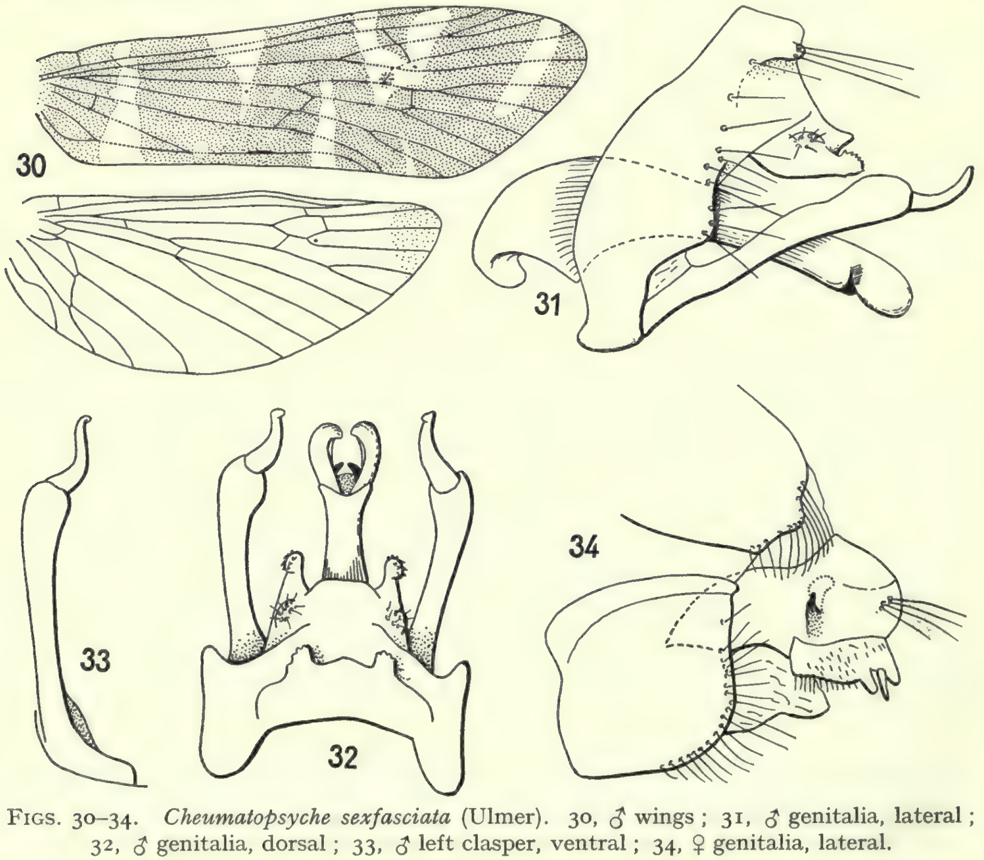
No further material of this species has yet come to hand and therefore a description and figure are given of the genitalia of the female HOLOTYPE, which has now been made into microscope preparations.

♀ GENITALIA. No reticulated areas on the fourth pleurites. Eighth sternite with the pleurosternum projecting beyond the apical margin of the sternite, giving the latter the appearance of being widely concave in side view. In ventral view, the apical margin is more or less straight, with a V-shaped excision between the two halves. Ninth segment short and with its dorsal margin strongly convex in side view. Clasper receptacle moderately broad at its opening, tapering to its apex, which is bent mesally. Clasper groove long, with a raised and sinuous basal margin. Fused ninth and tenth sternites membranous.

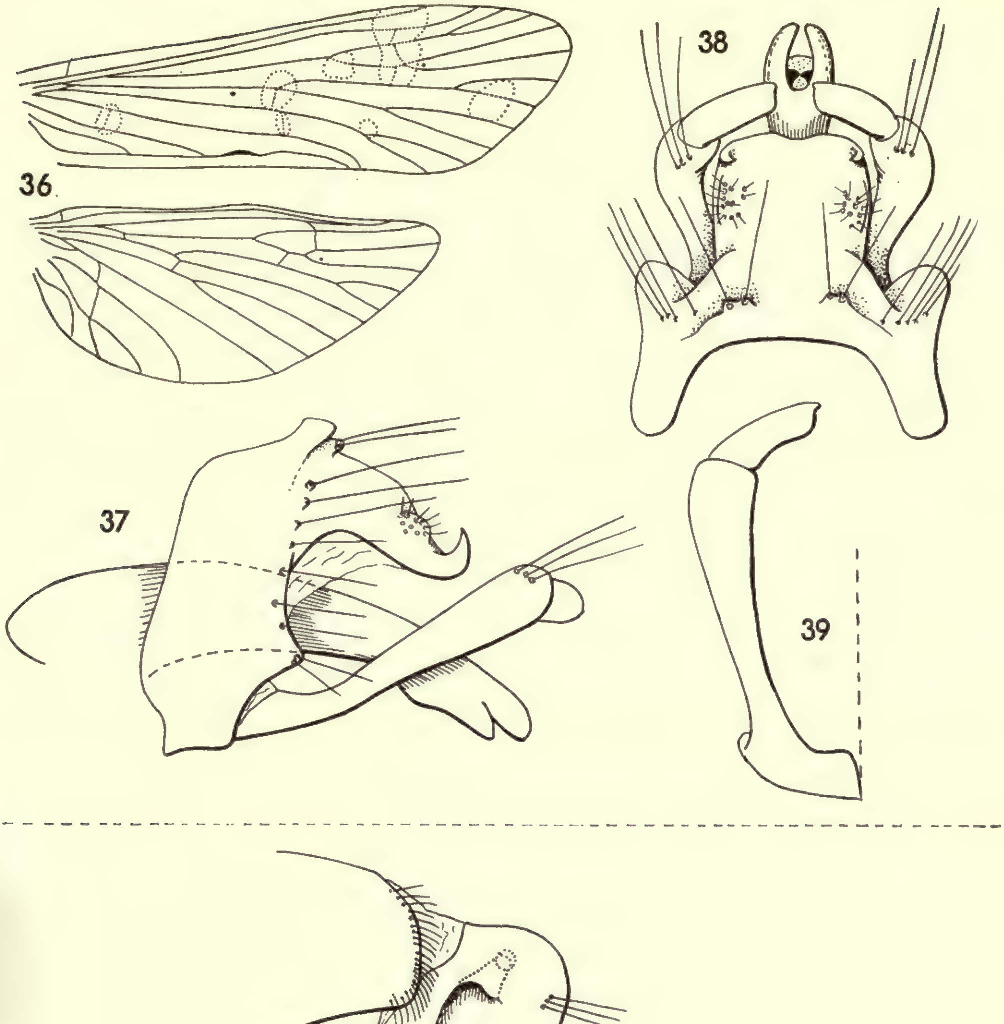
Cheumatopsyche albomaculata (Ulmer) comb. n.

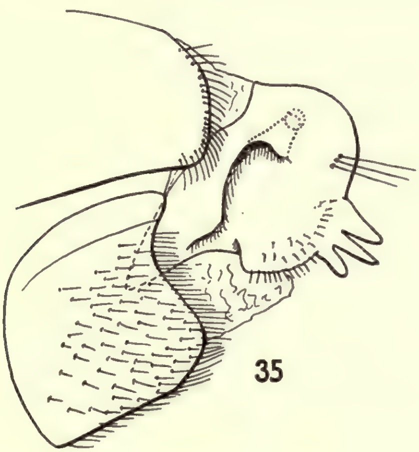
(Text-figs. 35–39)

Hydropsychodes albomaculata Ulmer, 1905 : 34, fig. 22 ; Mosely, 1939 : 27, fig. 80 ; Jacquemart, 1957 : 102, figs. 84–88.



FIGS. 30–34. *Cheumatopsyche sexfasciata* (Ulmer). 30, ♂ wings ; 31, ♂ genitalia, lateral ; 32, ♂ genitalia, dorsal ; 33, ♂ left clasper, ventral ; 34, ♀ genitalia, lateral.





FIGS. 35–39. *Cheumatopsyche bimaculata* (Ulmer), Type ♀. 35, genitalia, lateral. *Cheumatopsyche albomaculata* (Ulmer), ♂, 36, wings; 37, genitalia, lateral; 38, genitalia, dorsal; 39, left clasper ventral.

As mentioned in the generic introduction, the presence of an open median cell in the fore wing may not be a constant character. Ulmer's description of the general appearance and Mosely's figure of the fore wing are adequate, but as Jacquemart's figures of the male genitalia are a little confusing, I am giving new figures and descriptions of the male genitalia of the paratype presented to Mr. M. E. Mosely by Dr. Ulmer.

♂ GENITALIA. Ninth segment narrow above, fused to the tenth, its apical margin produced in a pair of small, setigerous lobes. Side-pieces moderately prominent and triangular. Tenth segment forming a quadrate plate or hood, lateral and apical margins slightly convex, the latter with a shallow median excision. The apical angles are produced upwards in small, recurved claws. There are two small, slightly raised, setigerous calli, one on each side rather beyond the middle. Aedeagus slightly curved, slender, lower margin gently convex beyond the middle. The apex bears two lateral lobes and beneath them a rounded ventral lobe. Basal segment of clasper in ventral view with a broad base, narrowing abruptly and then gradually dilating to a clavate apex. Terminal segment short, stout, in ventral view with outer apical angle slightly produced.

Distribution : CONGO.

The genitalia of *C. lesnei* (Mosely), from Mozambique and East Africa, strongly resemble *C. albomaculata* (Ulmer), but in *lesnei* the apical margin of the tenth segment is more produced at its centre and the apices of the claspers are more acute. In side view, the apical hooks of the tenth segment are smaller and more recurved in *lesnei*. The biggest difference is in the fore wings, which are brownish with white patches in *albomaculata*, and yellowish brown with small golden irrorations in *lesnei*.

Cheumatopsyche simplex sp. n.

(Text-figs. 40–44)

(In alcohol.) Head and thorax dark brown, with paler warts, pubescence fuscous. Antennae fuscous, darker at bases, and with traces of a dark brown, oblique line on segments basally (as in *Hydropsyche*). Palpi fuscous, second segment of maxillary palpus cylindrical. Legs pale fuscous. Abdominal tergites and sternites pale fuscous. Wings pale brownish hyaline, fore wing clothed with brownish pubescence, sometimes with faint golden mottling, which may be more obvious in living or dried specimens. Venation of fore wing recalling that of *C. albomaculata* (Ulmer), in that the median cell is frequently open. The footstalk of fork R_2 is short and the discoidal cell overlaps the base of fork R_4. The thyridial cell extends beyond the fork of the media and veins Cu_2 and $1A$ meet at a point, or are sometimes joined by a short cross-vein.

♂ GENITALIA. Ninth segment short, apical margin scarcely produced. Tenth segment short, fused to the ninth ; it forms a convex hood, with the apical lateral angles only very slightly produced, stumpy and truncate. The apical margin is widely and shallowly excised between the lateral angles. On either side of the tenth segment, towards the base, is a small, setigerous callus, and there is also a raised area of short setae on the dorsal surface. Aedeagus rather stout basally, tapering to about midway and then becoming cylindrical, with a slight ventral keel before the apex. The latter bears the usual pair of lateral lobes. Basal segment of clasper moderately slender, clavate and slightly more pigmented at its apex. Terminal segment very slender.

♀ GENITALIA. No reticulated areas on pleurites of fourth segment. Eighth sternite with the apical lateral margin rounded, sternite ventrally divided to its base by a narrow, median excision. Ninth tergite elongate, dorsal margin rounded. Ventral lateral margin not produced

in lateral lobes. Clasper receptacle narrow, curved caudad, clasper groove wide. Combined ninth and tenth sternites forming a lightly sclerotized plate, vase-shaped in ventral view.

Length of fore wing, ♂ 7 mm., ♀, 7·5 mm.

Holotype ♂, Dire Dawa distr., 5,000–8,000 ft. (*B. G. Hill*), BMNH, mounted as microscope preparations.

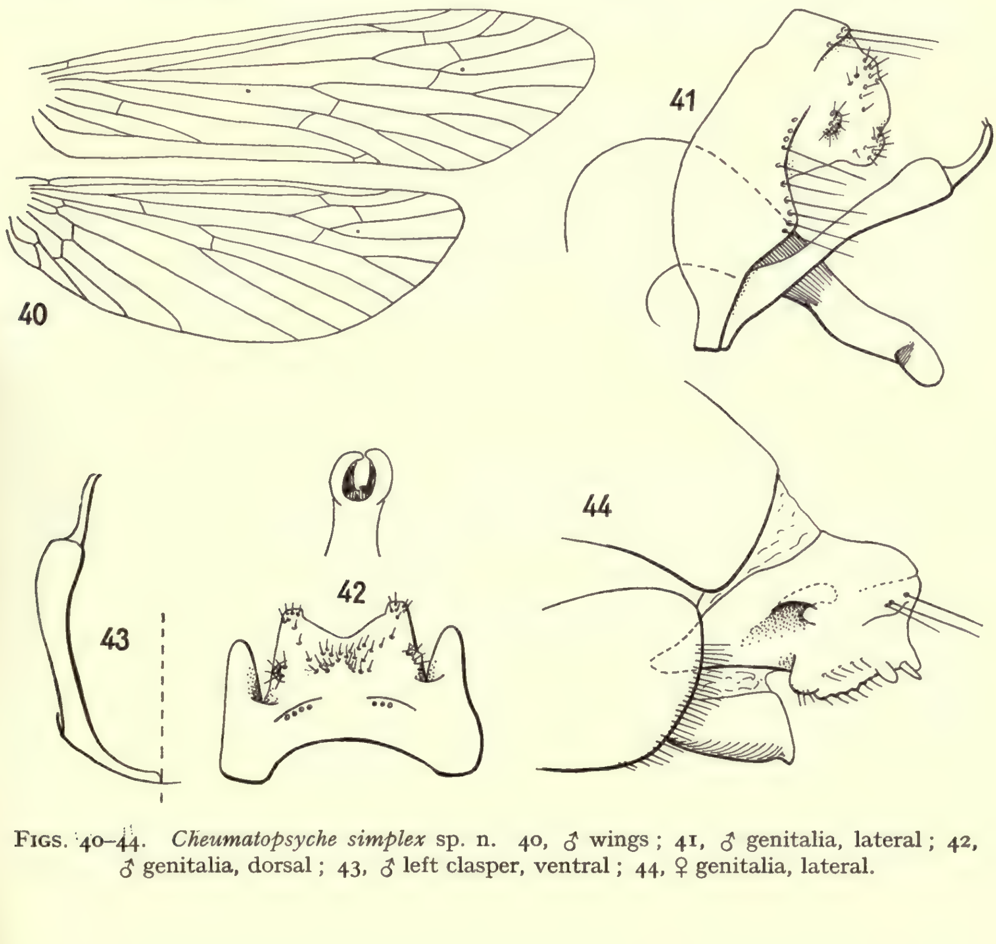
Allotype ♀, Dire Dawa distr., 5,000–8,000 ft. (*B. G. Hill*), BMNH.

Paratypes, Dire Dawa distr., 5,000–8,000 ft., 24 ♂, 1 ♀ (*B. G. Hill*), BMNH.

This species shares with *C. albomaculata* (Ulmer) the character of the median cell in the fore wing being frequently open in one or both wings. It may however be readily distinguished from that species by its immaculate wings, the cylindrical second segment of the maxillary palpus (triangular in *albomaculata*) and by the male genitalia.

Cheumatopsyche plutonis (Banks)

Symphitopsyche plutonis Banks, 1913 : 239, figs. 2, 4, 5.
Hydropsychodes plutonis (Banks) Ulmer, 1930 : 488, figs. 11–13.
Cheumatopsyche plutonis (Banks) Kimmins, 1960 : 257, 263.



FIGS. 40–44. *Cheumatopsyche simplex* sp. n. 40, ♂ wings ; 41, ♂ genitalia, lateral ; 42, ♂ genitalia, dorsal ; 43, ♂ left clasper, ventral ; 44, ♀ genitalia, lateral.

The Wachacha Ravine examples listed by Ulmer appear to be *C. afra* (Mosely). I have not seen any typical *C. plutonis*.

Cheumatopsyche obscurata (Ulmer)

(Text-fig. 45)

Hydropsychodes obscurata Ulmer, 1930 : 485, figs. 8–10.
Cheumatopsyche obscurata (Ulmer) Kimmins, 1960 : 263, figs. 20–23.

Dire Dawa district, 5,000–8,000 ft., 1961, 9 ♂, 2 ♀ (*B. G. Hill*).

Some examples in the series collected by Mr. Hill show a tendency towards an open median cell in the fore wing. As Ulmer's description was based upon males only, the opportunity is taken of describing and figuring the genitalia of the presumed female of *C. obscurata*.

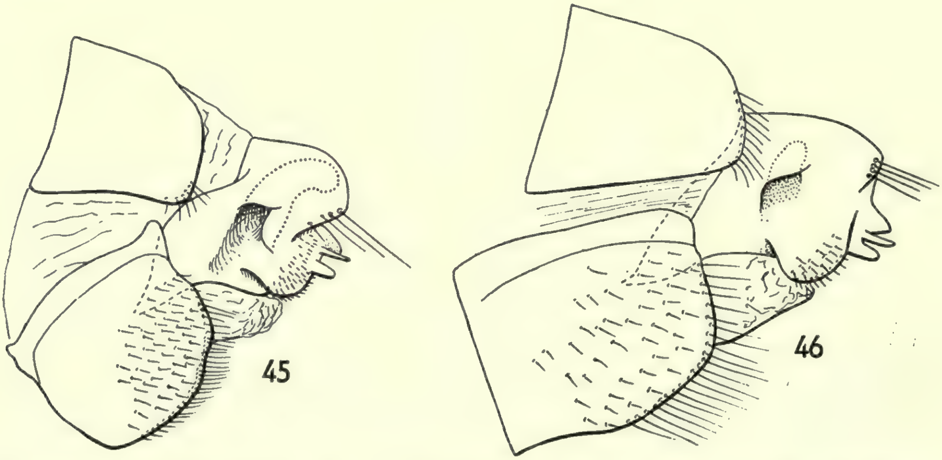
♀ GENITALIA. No reticulated areas on the pleurites of the fourth segment. Eighth sternite with apical lateral margin somewhat sinuously rounded, sternite divided to its base in ventral view, opening to a V-shaped excision beyond half way. Ninth tergite moderately elongate, dorsal margin rounded. Ventral lateral margin produced in a lateral lobe. Clasper receptacle large, curved caudad, reaching almost to the median line. Mouth of the receptacle with a thin, rounded lobe on distal side. Clasper groove broad and deep. Combined ninth and tenth sternites membranous.

Cheumatopsyche falcifera (Ulmer)

(Text-fig. 46)

Hydropsychodes falcifera Ulmer, 1930 : 482, figs. 4–6 (nec *H. falcifera* var. fig. 7).
Hydropsychodes zuluensis Barnard, 1934 : 360, figs. 37, h–j.
Cheumatopsyche falcifera (Ulmer) Kimmins, 1957 : 6, fig. 6 ; id., 1960 : 263, figs. 24–27.

Ghibe River, 215 km. from Addis Ababa, 13–14.iv.1961, numerous ♂♂ (*A. Tjønneland*).



FIGS. 45–46. *Cheumatopsyche* spp. ♀ genitalia, lateral. 45, *Ch. obscurata* (Ulmer) ; 46, *Ch. falcifera* (Ulmer), paratype.

In comparison with the type of *falcifera*, these males show some slight difference in genitalia. The apical processes of the tenth segment have the ventral margin straight, not sinuous, in side view. The terminal segment of the clasper is slightly more slender in ventral view. These differences are not considered to be of specific importance. The degree of divergence of the apical lateral lobes of the aedeagus is not necessarily of specific value, since they possess a certain degree of movement.

There are no females which can be associated with certainty with the Ghibe River males. The collection from this locality also included numerous males of a smaller and darker species (*C. nubila* **sp. n.**), and the females taken at the same time are referred to that species on the grounds of size and general appearance. One can only assume that females of *falcifera* were not on the wing on this particular night.

As the female of *C. falcifera* has not been figured or described, this omission is remedied with the aid of a paratype from the Muger Valley.

♀ GENITALIA. No reticulated area on the pleurites of the fourth abdominal segment. Pleurosternum of eighth segment scarcely projecting beyond apical margin of sternite, which is gently rounded in ventral view. Ninth tergite short and deep, clasper receptacle short and broad, clasper groove inconspicuous. Lower angle of tenth tergite in side view large and rounded. Ninth and tenth tergites lightly sclerotized.

Cheumatopsyche nubila sp. n.

(Text-figs. 47–50)

Cheumatopsyche ? thomasseti (Ulmer) Kimmins, 1960 : 265, fig. 70 (♀, Jameson's Drift).

(In alcohol.) Head dark brown, with scanty golden pubescence. Antennae each with the two basal segments brownish, following segments luteous, faintly annulated, the segments becoming progressively fuscous towards the apices of antennae. Palpi fuscous, second segment of maxillary cylindrical. Thorax dark brown above, paler on sides. Legs luteous, with fuscous pubescence, the median femora pale fuscous. Fore wing membrane pale fuscous, with paler irrorations, veins fuscous. Pubescence fuscous, with golden spots, probably dense in life but largely denuded in alcohol. Hind wing pale fuscous.

♂ GENITALIA. Similar in pattern to *C. thomasseti*. Ninth segment with dorsal projections stronger and side-pieces more triangular. Tenth segment in side view narrower at apex and the lateral apical processes shorter and stouter, the excision between the clavate part and apical margin of tergite narrow. In dorsal view, the apical processes are ovate rather than transverse. Aedeagus with dorsal margin slightly excavate before apex in side view. Terminal segment of clasper in ventral view narrower.

♀ GENITALIA. Fourth pleurite with a quadrangular reticulated area on each side. Lateral apical margin of eighth sternite shallowly excised below the pleurosternum, then smoothly convex in side view. In ventral view, sternite excised to its base, excision narrow and parallel-sided. Clasper receptacle of ninth segment large and complex, its basal side partly covered by a narrow flange. Apical margin of opening extending along distal margin. Throat of receptacle rugose, apex bent back upon itself in a ventral direction. Ventral margin of ninth tergite sinuous at base. Tenth tergite short and deep.

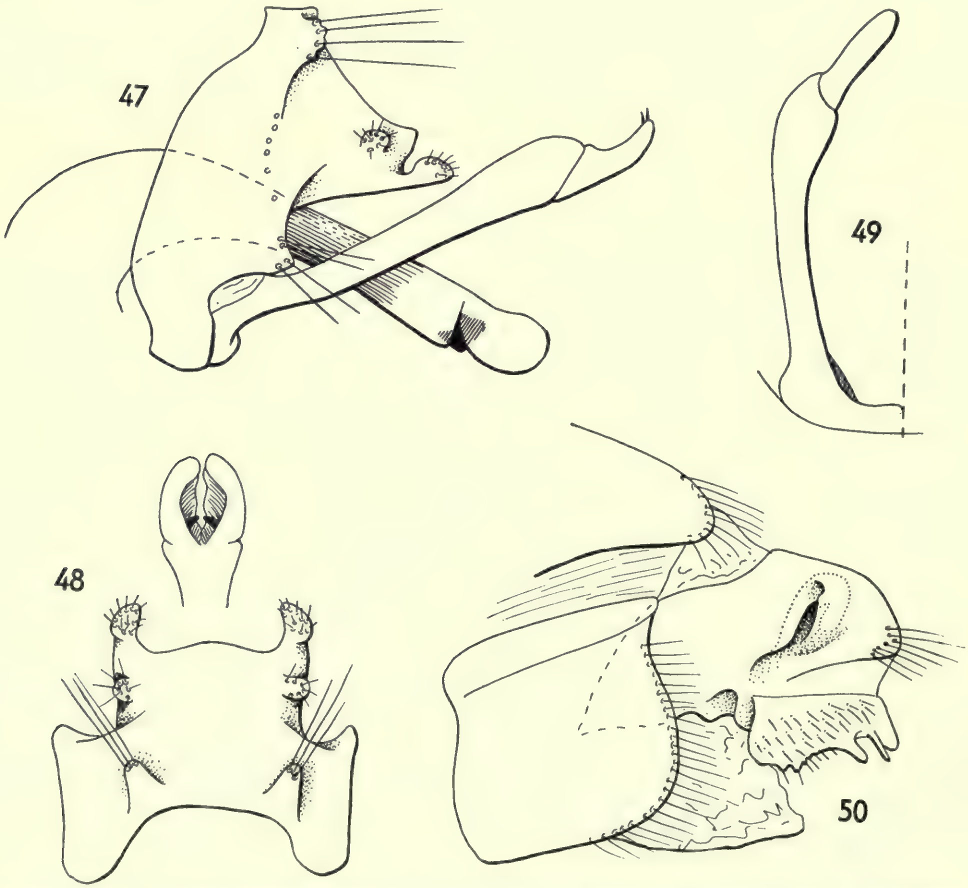
Length of fore wing, ♂, ♀, 6·25 mm.

Holotype ♂, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Paratypes, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, numerous ♂, ♀ (*A. Tjønneland*), BMNH, UCAA.

This species appears to be related to *C. thomasseti* (Ulmer), and the differences in the male genitalia are set out above. In the females, both species have the reticulated areas on the fourth pleurite, but *nubila* may be distinguished by its much more complex clasper receptacle. The female genitalia of this species were first figured by Kimmins (1960) under the name *C. ?thomasseti* (Ulmer), from an example taken in Natal, at Jameson's Drift, 29.iv.1954. The males taken at the same time were then identified as *thomasseti*, but subsequent examination has shown them to be *C. nubila*. The Ethiopian examples were taken in a light trap in company with many males of *C. falcifera* (Ulmer). In general appearance, *C. nubila* is both smaller and darker brown than *C. falcifera*.



FIGS. 47–50. *Cheumatopsyche nubila* sp. n. 47, ♂ genitalia, lateral; 48, ♂ genitalia, dorsal; 49, ♂ left clasper, ventral; 50, ♀ genitalia, lateral.

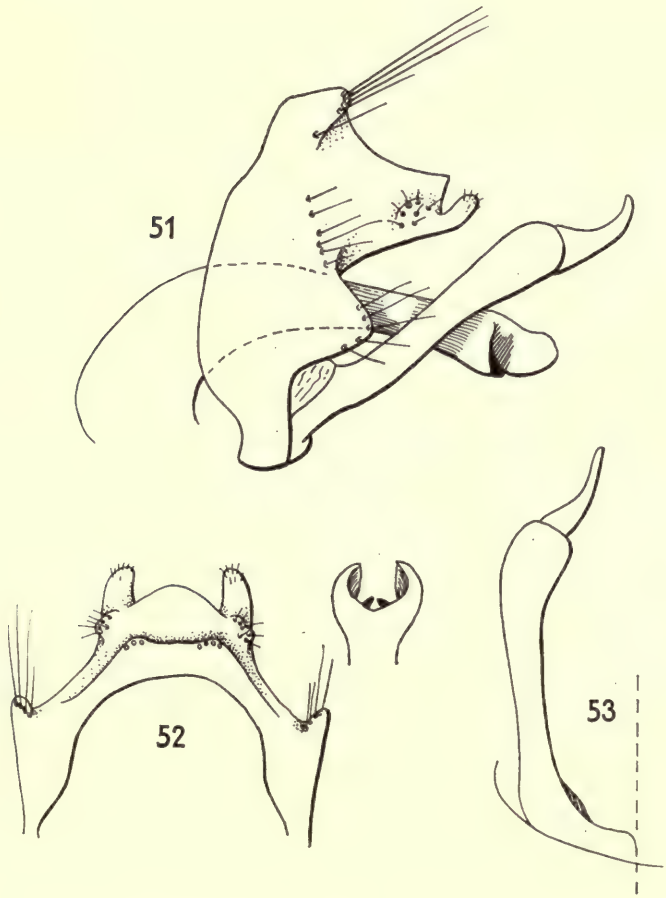
Cheumatopsyche afra (Mosely)

(Text-figs. 51–53)

Hydropsychodes afra Mosely, 1935 : 229, figs. 17–20.
Hydropsychodes falcifera Ulmer, var. 1930 : 485, fig. 7 (Muger Valley ♂), **syn. n.**
Hydropsychodes plutonis (Banks) Ulmer (partim), 1930 : 491, fig. 14 (Wachacha Ravine examples).
Hydropsychodes lateralis Barnard (partim), 1934 : 362–364, figs. 37 a–f, 38.
Cheumatopsyche afra (Mosely) Kimmins, 1960 : 266, figs. 36–67, 72–76.

Koka Dam, 16–17.i, 9.iii.1961 ; Dawa River, 12 km. N. of Hudat, 12.iv.1961 ; stream near Gofa village, 14.iv.1961 (*A. Tjønneland*) ; Ghibe River, 260 km. from Addis Ababa, 6.v.1961 (*S. Chojnacky*).

Numerous examples from most of the above localities. Examination of the specimens figured by Ulmer (1930) as a variety of *C. falcifera* and as a variety of



FIGS. 51–53. *Cheumatopsyche afra* (Mosely). ♂ genitalia of *Ch. falcifera* (Ulmer), var. 51, lateral ; 52, dorsal ; 53, left clasper, ventral.

C. plutonis (Banks) reveals that they are forms of the widespread and variable species *C. afra* (Mosely).

Cheumatopsyche sp.

Gamo Prov., Gughé highlands, Bonghé, c. 9,000 ft., 29.xii.1948, from foliage of willows and flood-refuse by stream in flat valley, 2 ♀ (*Hugh Scott*); Sokorro stream, Wodorro village, 22–23.iv.1960, 1 ♀ (*A. Tjønneland*).

Hydropsyche propinqua Ulmer

Hydropsyche propinqua Ulmer, 1907 : 21, figs. 32–33 ; Mosely, 1939 : 22–23, figs. 64–66.

Ghibe River, 260 km. from Addis Ababa, 6.v.1961 (*S. Chojnacky*).

Previous distribution : CAMEROONS.

Hydropsyche abyssinica sp. n.

(Text-figs. 54–59)

(In alcohol.) Head dark brown, with piceous hairs. Antennae and palpi pale fuscous. Thorax dark chestnut-brown above, paler on sides. Legs luteous, with fuscous pubescence. Fore wing with fuscous pubescence, rather denuded but with traces of small spots of golden pubescence. Hind wing hyaline, with fuscous pubescence. Venation (fig. 54) differing in some details from the typical *Hydropsyche* pattern. In the fore wing, Cu_2 and $1A$ end separately in the wing margin. In the hind wing, fork R_2 is absent, the median cell is open and M does not run very close to Cu_1. Abdomen luteous, shaded with purplish.

♂ GENITALIA. Side-pieces of ninth segment broad and rounded. Tenth segment fused to ninth, in side view nearly as long as ninth, slightly tapering to a bluntly rounded apex, which bears a small, triangular lobe on each side. On the sides are several groups of setae. From above, the tenth segment also tapers gently towards the apex, which is blunt and with a narrow, U-shaped, median excision. The triangular lobes appear as small processes at the lateral angles. Aedeagus short, bent downwards to a somewhat clavate apex. Beneath the apex is a slender process, extending slightly beyond the apex and terminating in a pair of rather transparent, divergent fingers. On each side of the aedeagus, shortly before the apex arises a short, membranous process, directed laterally and fringed with stout setae. Clasper with a long and rather slender basal segment, slightly clavate apically and a very short terminal segment, tapering to an acute apex.

♀ GENITALIA. Eighth sternite in ventral view with a wide, V-shaped excision of the apical margin, which extends nearly half way to the base of the sternite. In side view, apical margin is irregularly rounded. Ninth tergite with its ventro-caudal margin produced in a rounded, laminate lobe, fringed with setae. Clasper groove broad and curved, the clasper receptacle reduced to a minute pit. Combined ninth and tenth sternites lightly sclerotized.

Length of fore wing, ♂, 8 mm., ♀, 11 mm.

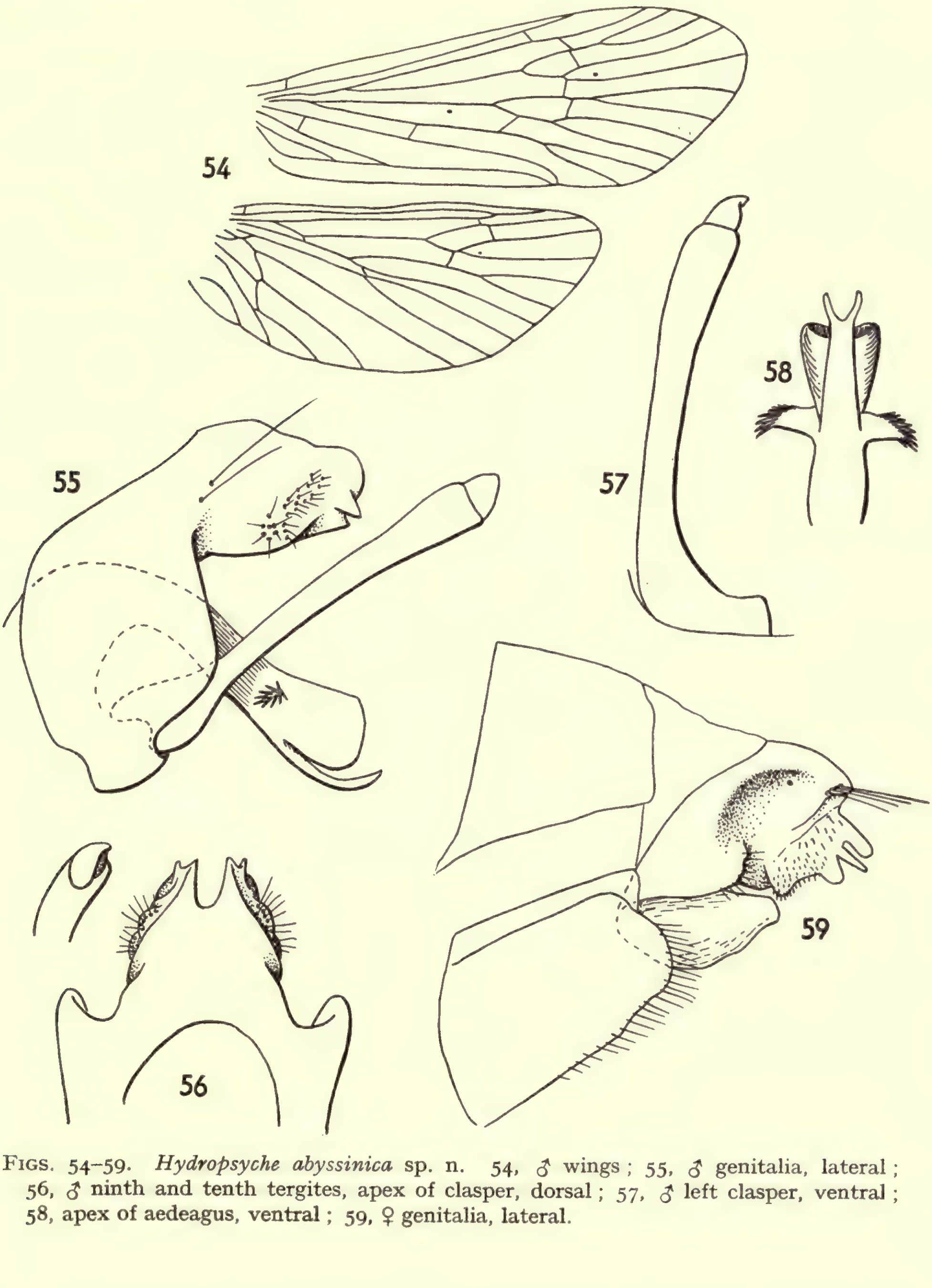
Holotype ♂, Koka Dam, 29.iii.1962 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Koka Dam, 29.iii.1961 (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, hind wing and abdomen mounted as microscope preparations.

Paratypes, Wondo Abella, 24.iv.1960, 1 ♂; Koka Dam, 29.iii.1961, 11 ♂,

numerous ♀; stream near Gofa village, 15 km. from Adolla, 14.iv.1961, 1 ♀ (*A. Tjønneland*), BMNH, UCAA.

This species has been retained in the genus *Hydropsyche*, in spite of the differences in the wing venation, on the obvious similarity of the male genitalia with those of



FIGS. 54–59. *Hydropsyche abyssinica* sp. n. 54, ♂ wings; 55, ♂ genitalia, lateral; 56, ♂ ninth and tenth tergites, apex of clasper, dorsal; 57, ♂ left clasper, ventral; 58, apex of aedeagus, ventral; 59, ♀ genitalia, lateral.

the *propinqua*-group of *Hydropsyche.* The open median cell in the hind wing is the most important difference ; this generic character has already been found to be unstable in the New Zealand species, where the median cell is also usually open. One could, of course, continue the process of dismembering the genus *Hydropsyche*, and make further new genera, but such an operation would be better undertaken during a major revision of the Hydropsychine genera than in a paper on a local fauna.

H. abyssinica **sp. n.** comes nearest to *H. namwa* Mosely (1939 : 25) and may be distinguished by the much shorter terminal segment of the clasper and by differences in the aedeagus and tenth tergite, and of course by the absence of fork R_2 and the median cell in the hind wing.

Subfamily DIPLECTRONINAE

Diplectronella? afra Mosely

Mosely, 1931 : 202–205, figs. 10–13.

Gamo Prov., Gughé Highlands, Bonghé, c. 9,000 ft., 29.xii.1948, from foliage of willows and flood refuse by stream in flat valley, 1 ♂ (*H. Scott*).

This specimen is referred here with some doubt. It is larger than typical *D. afra* and there are slight differences in male genitalia. Should more material confirm that these differences are constant, it will be necessary to erect a new specific name for it.

Diplectronella sp.

Wondo Abella, cold stream, 24.iv.1960, 1 larva (*A. Tjønneland*).

Family LEPTOCERIDAE

Subfamily LEPTOCERINAE

Pseudoleptocerus schoutedeni Navás

Mosely, 1933 : 541–544, figs. 6–10.

Koka Dam, 29.iii.1961, 4 ♂, 5 ♀; Lake Margherita, 8–9.iv.1961, 2 ♀; stream near Gofa village, 15 km. from Adolla, 14.vi.1961, 3 ♂, 4 ♀; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 4 ♂, 4 ♀ (*A. Tjønneland*).

Previous distribution : CONGO, RUANDA, UGANDA and SUDAN.

Pseudoleptocerus corbeti Kimmins

Kimmins, 1957 : 17–19, figs. 10–11.

Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, numerous ex. (*A. Tjønneland*).

A few male and females of *Ps. schoutedeni* Navás were taken with the Ghibe River examples of *corbeti*. The females of *schoutedeni* may be distinguished from *corbeti* by the dense black pubescence of the maxillary palpi. In *corbeti* the palpi are sparsely clothed with grey and black pubescence.

Previous distribution : UGANDA.

Triaenodes triaenodiformis (Ulmer) **comb. n.**

(Text-figs. 60–66)

Adicella triaenodiformis Ulmer, 1930 : 493–495, figs. 16–17 (♀).

The genitalia of a female example taken by Tjønneland are identical with those of *Adicella triaenodiformis* Ulmer and the wing venation also agrees in possessing a complete, though weak, stem to *M* in the fore wing. Ulmer has pointed out that the venation is very like that of *Triaenodes* apart from the presence of a complete stem to *M* in the fore wing, a character which has since been found to be somewhat unreliable. In view of the greater resemblance of the female genitalia to *Triaenodes* than to *Adicella*, I therefore transfer this species to *Triaenodes* and describe and figure the male genitalia. The specimens collected by Tjønneland are somewhat rubbed and show no traces of wing pattern.

♂ (in alcohol). Antennae pale tawny, finely annulated with piceous at the joints, basal segment long and with a long tuft of silky hairs on the dorsal surface at the base.

♂ GENITALIA. Ninth segment narrowed above, the centre of the apical dorsal margin produced and slightly bilobed. Tenth segment long, its apical two-thirds forming two very slender spines, dilated caudad. Each spine, before its apex, is looped backwards twice to form two tight, spring-like coils, then continuing caudad and slightly upward to an acute apex, giving the two spines the appearance of a pair of horns or a two-pronged fork. Cerci long, not very slender, apices curving slightly inwards and downwards. Aedeagus rather shorter than the tenth segment, bent downwards and widening before midway. From above, it forms an open trough, with a bifid, membranous structure arising from its centre. Clasper from beneath triangular, inner margin divergent and straight, outer sinuous, tapering to a narrow apex. The inner surface is armed with a number of stout spines. The outer margin is produced about midway in a short branch. There are two basal branches with a common origin on the dorsal surface. Both are slender at base, the inner one bent downwards before midway and becoming spatulate, situated alongside the aedeagus. The outer one is directed caudad, becoming slightly clavate apically. In the ventral illustration, the vestiture has been omitted on one side to show the branches more clearly.

♀ GENITALIA. Apical margin of eighth sternite straight and densely fringed with setae. Ninth tergite short, fused to the short, tubular tenth segment, which has an excised ventral margin. Cerci closely appressed to the tenth segment, roughly pentagonal from the side, triangular from above. Lateral gonapophyses short, rounded, convex externally, apices incurved. Subgenital plate broad, its centre strongly elevated in a narrow, longitudinal ridge, which terminates in a small, projecting lobe. Apical margin of subgenital plate sinuous, lateral margins rounded. Internal structure somewhat obscure, trilobed basally.

Length of fore wing, ♂, 7·3 mm., ♀, 6·7 mm.

Holotype ♀ in the BMNH ; the abdomen has been cleared and preserved in glycerine.

Allotype ♂ : Ghibe River, 260 km. from Addis Ababa, 6.v.1961 (*S. Chojnacky*), BMNH.

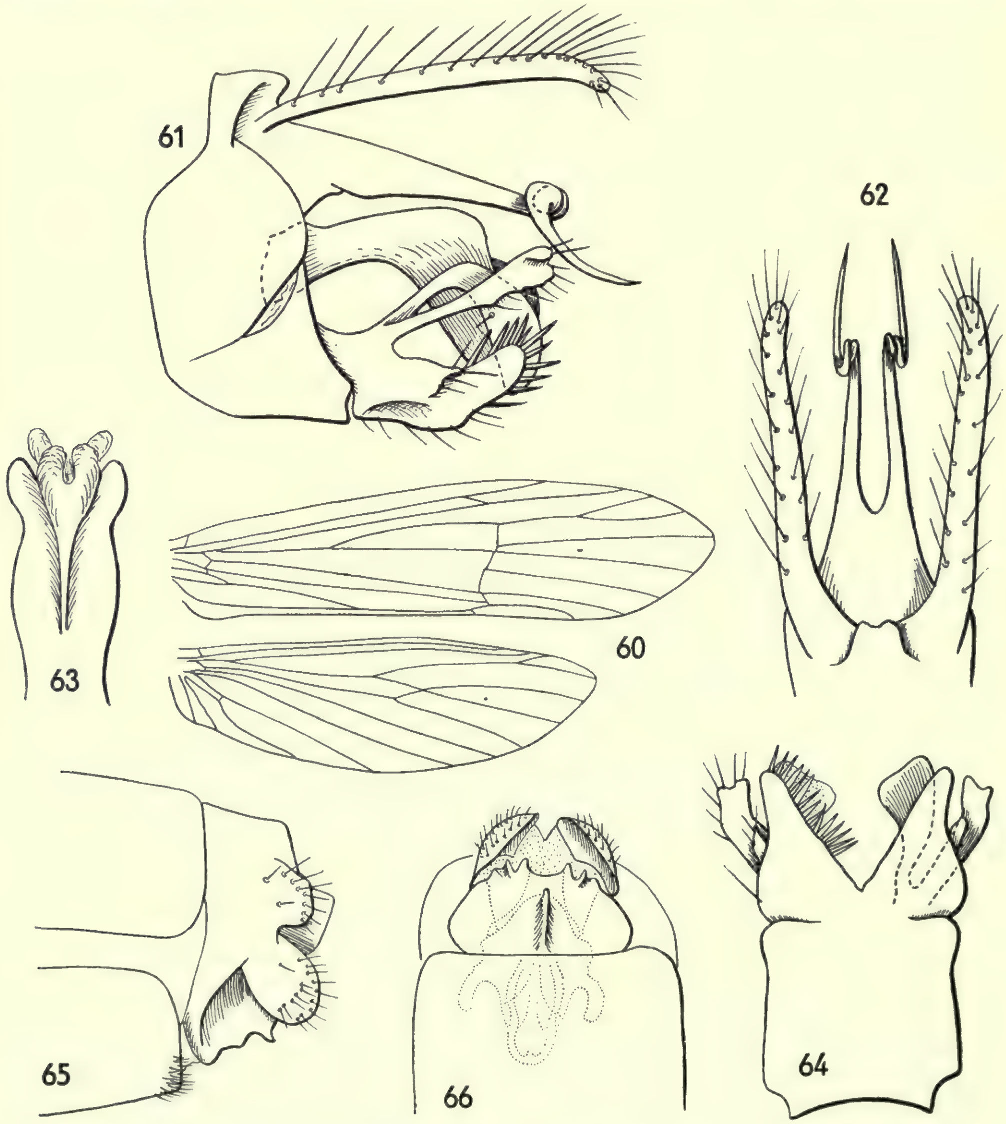
Additional material : Stream near Gofa village, 15 km. from Adolla, 1 ♂ ; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 6 ♂, 1 ♀, (*A. Tjønneland*), BMNH, UCAA; N. RHODESIA : R. Zambezi, Katambora, iv. 1962, 1♂ (*E. Pinhey*)

In male genitalia this species differs from any African *Triaenodes* known to me in its tenth tergite with the double-coiled spines. *T. serrata* Ulmer and *T. falculata* Kimmins both have a long, curved spine arising from the tenth tergite, but the

spine is usually single and more or less flexibly attached to the undivided tergite. *T. triaenodiformis* has possibly evolved from a species with a deeply divided tergite, such as *T. legona*, *T. wambana* or *T. darfurica*.

Triaenodes sp. near ***elegantula*** Ulmer

Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 1 ♂ (*A. Tjønneland*).



FIGS. 60–66. *Triaenodes triaenodiformis* (Ulmer). 60, ♂ wings; 61, ♂ genitalia, lateral; 62, ♂ ninth and tenth tergites, dorsal; 63, ♂ aedeagus, dorsal; 64, ♂ ninth sternite and claspers, ventral; 65, ♀ genitalia of type, lateral; 66, the same, ventral.

This specimen is clearly related to *T. elegantula* Ulmer, but differs in certain details in male genitalia. It is probably a new species, but it is being left undetermined, pending the discovery of more material.

Triaenodes sp.

Gamo Prov., Gughé Highlands, Bonghé, c. 9,000 ft., 29.xii.1948, 1 ♀ (*H. Scott*).

Parasetodes sudanensis Ulmer

Lake Margherita, 8–9.iv.1961; Dawa River, 12 km. N. of Hudat, 12.iv.1961; stream near Gofa village, 15 km. from Adolla, 14.iv.1961; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*).

Fair series of this species were obtained from most of the above localities.

Previous distribution: Sudan, Uganda, Katanga and Mozambique.

Athripsodes fissa (Ulmer)

Athripsodes jinjana Kimmins, 1957: 24–26 (partim, ♀ allotype and majority of females, fig. 17 D).

Lake Awasa, 6, 27.xi.1960; Lake Langano, 7.iv.1961; Black River, near Lake Awasa, 15.iv.1961; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*).

A species widely distributed in Africa.

Athripsodes jinjana Kimmins

(Text-fig. 67)

Kimmins, 1957: 24–26, fig. 17 (partim, nec fig. D).

Koka Dam, 29.iii.1961, 1 ♂, 1 ♀; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, ♂♂, ♀♀ (*A. Tjønneland*); Ghibe River, 260 km. from Addis Ababa, 6.v.1961, 1 ♂ (*S. Chojnacky*).

67

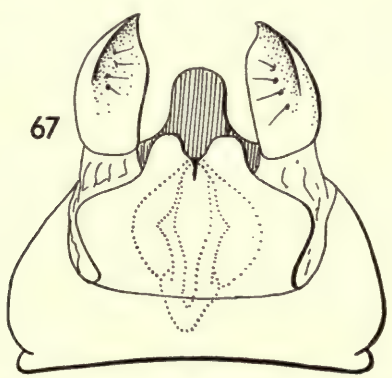


Fig. 67. *Athripsodes jinjana* Kimmins. ♀ genitalia, ventral.

Since the description of this species was published, I have had doubts whether the female figured as that of *A. jinjana* was correctly associated. When dealing with the Ethiopian material, the females of the type-series of *A. jinjana* were re-examined and I now believe that females of two species were included. The allotype female, most of the paratype females from Jinja and the two females from Bukakata should be transferred to *A. fissa* (Ulmer). Three females from Jinja and the females from Kampala and Entebbe are different and are probably the true females of *A. jinjana* Kimmins. I am therefore giving a new figure of the female genitalia of the latter species. The chief differences are in the shape of the apical margin of the subgenital plate, which in *jinjana* is sinuous and produced at its centre in two spatulate lobes with a V-shaped excision between them. In *fissa* the apical margin forms an obtuse angle, the sides of the median excision being either parallel or concave, so that the angles may appear to approach each other. The median, dorsal process of the ninth-tenth segment is spatulate in ventral view in *jinjana*, whereas in *fissa* it is bluntly triangular, variable in size, sometimes much reduced.

It is interesting to note that, in the Ghibe River examples, the venation of the fore wing of the female is variable, the additional apical vein characteristic of *Athripsodes* females sometimes being absent, i.e. of the *Homilia* type, although there are no appreciable differences in the genitalia of the two forms. This is further evidence that the separation of *Athripsodes* and *Homilia* is not really justifiable.

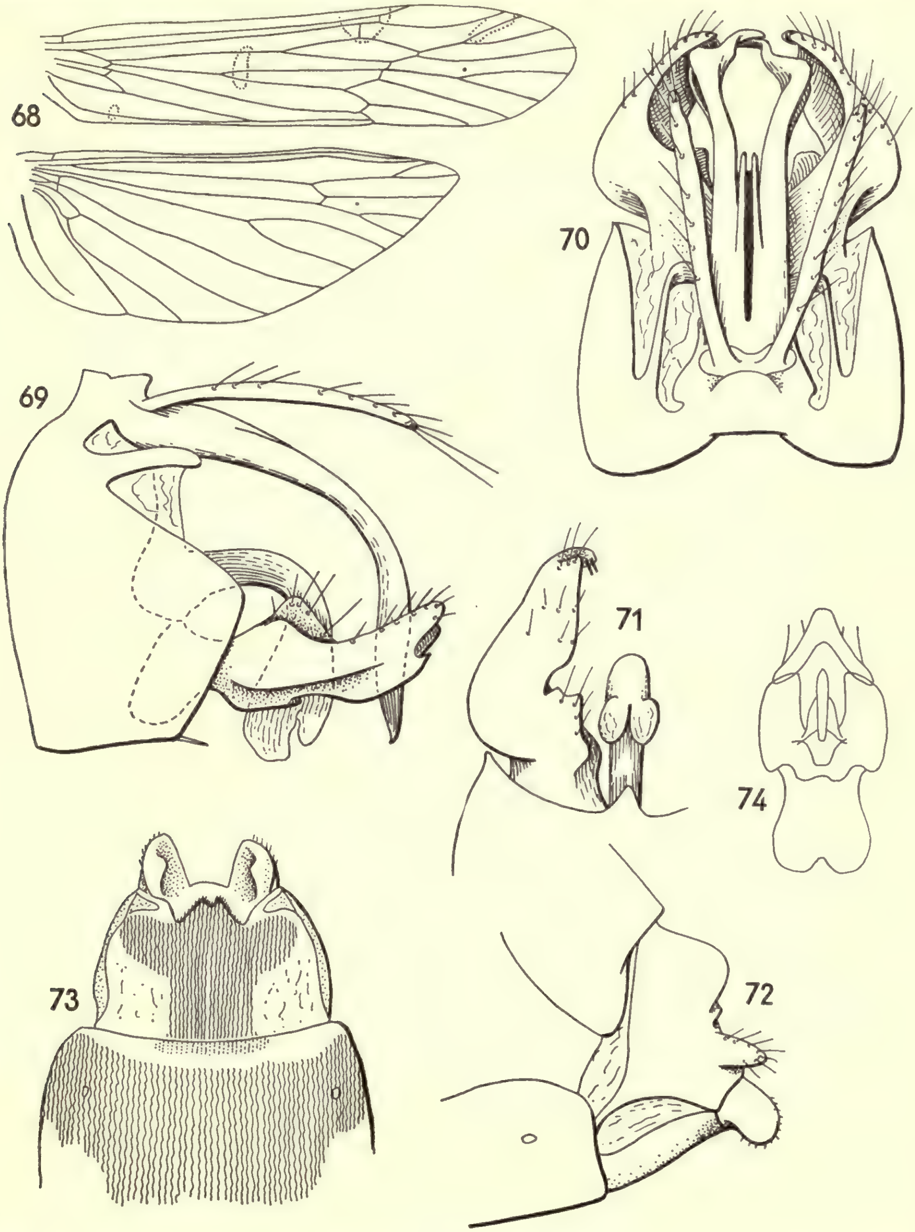
Athripsodes niveosquamosa sp. n.

(Text-figs. 68–74)

(In alcohol.) Head piceous above, with piceous hairs, fuscous on front, hairs between antennae white. Antennae pale fuscous, with darker articulations, segments paler at base in basal half of antennae. Palpi piceous. Thorax piceous above, fuscous on sides. Femora mainly piceous, tarsi, tibiae and apices of posterior femora paler, the basal segment of both median and posterior tarsi whitish. Abdomen pale fuscous, apical segments fuscous. Membrane of fore wing fuscous, with three paler areas, a slightly lunate area extending from *Rs* across the base of the thyridial cell, a conspicuous triangular area at the base of the pterostigma, and a smaller streak extending obliquely forward and outward from the base of R_2 to the apex of R_1. The pubescence is piceous, with whitish hairs on the paler areas of the membrane and, in unrubbed specimens, with scattered, elongate-oval, white, scale-like hairs along the main veins. These scale-like hairs are present in both sexes. In the fore wing, the discoidal cell is strongly constricted apically, as in *A. mandana* (Mosely). In the hind wing, the membrane is smoky hyaline, rather darker behind the media and with sparse fuscous pubescence.

♂ GENITALIA. Similar in general pattern to *A. mandana* (Mosely). The ninth segment has its ventral, apical margin less produced, the blunt lobe of *mandana* being represented by a very thin, triangular process. Side-pieces forming a right-angle and, from above them, on each side, arises a slender strut, projecting tailward and then ventrally and forming part of the basal attachment of the aedeagus. Tenth segment with four branches, the outer pair long, spiniform, curving downward and becoming somewhat sinuous apically in dorsal aspect. The inner branches are less than half as long as the outer, straight, slender and rather inconspicuous. Cerci long and slender. Aedeagus short, angled downwards, apex membranous and bilobed. Claspers much as in *mandana*, strong and caliper-like, inner ventral margins much more produced than in *mandana* and with a notch at about one-third from base. This ventral flange gives the apex of the clasper a trifid appearance. Outer margins of clasper strongly ridged, inner dorsal margin produced upward in a triangular lobe.

♀. Smaller than male and with the customary additional apical cell in the fore wing. ♀ GENITALIA. Eighth sternite broadly pigmented. Ninth tergite from above with apical margin forming two convex projections with a narrow excision between them. Cerci short and flattened, apices elliptical. Lateral gonapophyses short and rounded, inner surface with sinuous lobes.



FIGS. 68–74. *Athripsodes niveosquamosa* sp. n. 68, ♂ wings; 69, ♂ genitalia, lateral; 70, the same, dorsal; 71, ♂ clasper and aedeagus, ventral; 72, ♀ genitalia, lateral; 73, the same, ventral; 74, ♀ vaginal structure, ventral.

Subgenital plate with centre of its apical margin triangularly produced, its apex excised. The plate bears a large, mushroom-like pigmented area.

Length of fore wing, ♂, 9 mm., ♀, 7–8 mm.

Holotype ♂, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, with abdomen mounted on holotype ♂ microscope slide.

Paratypes, Koka Dam, 29.iii.1961, 2 ♂, 1 ♀ (*A. Tjønneland*); Gojeb River, 10.iv.1961, 1 ♂, 1 ♀ (*G. Hodera*); Ghibe River, 260 km. from Addis Ababa, 6.v.1961. numerous ex., ♂, ♀; Awash River, near Hot Springs, 13.v.1961, 1 ♂ (*S. Chojnacky*); Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, numerous ex., ♂, ♀ (*A. Tjønneland*), BMNH, UCAA.

This species is clearly related to *Athripsodes mandana* (Mosely), both in venation and in male genitalia. The differences in the latter are detailed in the foregoing description. In the wings, *A. mandana* also has the whitish area near the pterostigma but the other areas are not mentioned, nor does Mosely give the colour of the wings. The hind wing of *A. niveosquamosa* is rather broader than in *mandana*. The scale-like hairs on the main veins of the fore wing recall *A. aurifera* (Navás), described as a *Homilia*, but in that species the " scales " are golden yellow and the general description differs from *A. niveosquamosa*.

Leptocerina ramosa ramosa (Ulmer)

(Text-figs. 75–78)

Leptocerus ramosus Ulmer, 1912 : 103–105, figs. 27–29.
Leptocerina ramosa (Ulmer), Mosely, 1932 : 298.

Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 3 ♂ (*A. Tjønneland*).

These three examples do not agree entirely with Ulmer's figures of *L. ramosa*. His figure is from a defective example, with the cerci missing, and the figures were made from a pinned example. In consequence, the aedeagus and tenth tergite are shown as a single structure. The claspers are similar in shape, although the upper branch is relatively a little longer and its inner dilatation more pronounced. These slight differences do not amount to a subspecific distinction and I propose to consider the Ethiopian examples as *L. ramosa ramosa* (Ulmer). In order that other workers may have the opportunity of forming their own opinions as to the identity of these specimens, I am giving figures of the wings and male genitalia.

Previous distribution : CAMEROONS.

Leptocerina spinigera Mosely

Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 14 ♂ (*A. Tjønneland*).

Previous distribution : SIERRA LEONE.

Leptocerina talopa Mosely

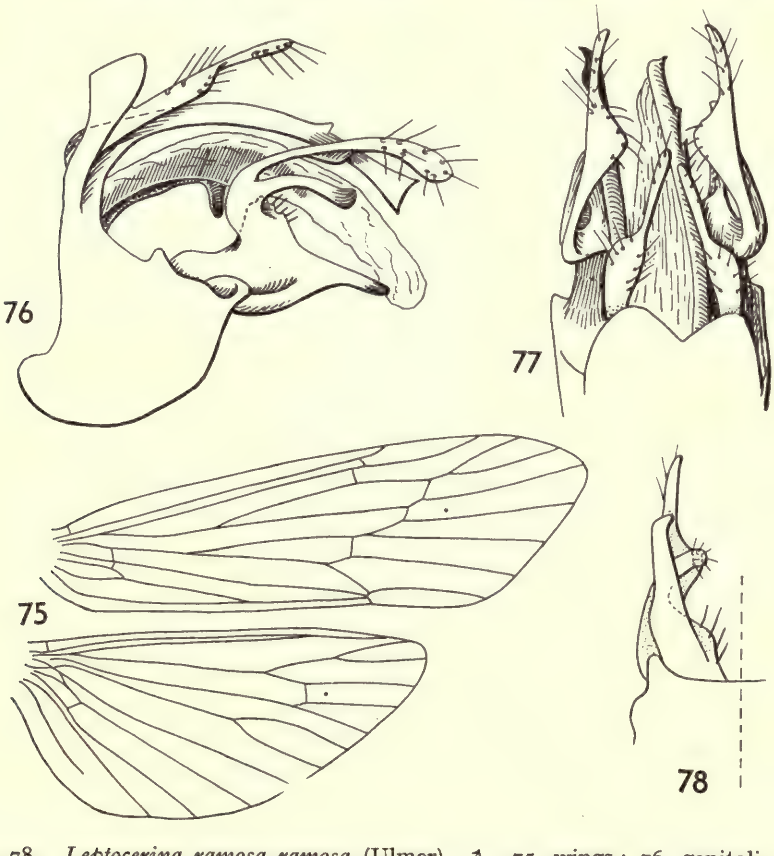
Gofa village, 15 km. S. of Adolla, 17.iv.1960, 2 ♂ (*A. Tjønneland*).
Previous distribution : UGANDA.

Tagalopsyche aethiopica sp. n.

(Text-figs. 79–86)

(In alcohol.) Head fulvous, eyes purplish. Postero-lateral warts strongly elevated, long, close to eye and about half as long as its diameter ; anterior warts small and circular. Antennae with two basal segments pale fulvous, remainder luteous, with fuscous articulations, which fade out apically. Palpi pale fuscous, maxillary densely fringed with fuscous hairs, segments two and three long, subequal, one a little shorter than two but longer than four, five shortest. Thorax pale yellowish brown. Legs pale fulvous, with fuscous pubescence, spurs 0.2.2. Abdomen pale luteous, the tergites and sternites faintly shaded with fuscous. Fore wing densely clothed with short, pale fuscous pubescence, the main veins with tufts of darker, more upstanding pubescence. Hind wing with sparse fuscous pubescence.

♂ GENITALIA. Ninth segment short, the centre of its ventral apical margin produced in a



FIGS. 75–78. *Leptocerina ramosa ramosa* (Ulmer), ♂. 75, wings ; 76, genitalia, lateral ; 77, the same, dorsal ; 78, left clasper, ventral.

short, transverse lobe, whose base is also extended upwards in a tongue beneath the aedeagus. Tenth segment fused to ninth, in side view forming a triangular hood over aedeagus. From above, it is broad basally, with two rounded, median projections ; the apex is narrow and spatulate. Cerci narrow, elongate, about as long as tenth segment. Aedeagus short, arched downwards, from beneath dilated about midway. Clasper from the side rather narrow at base, upper apical angle produced upwards in a rounded lobe, lower apical angle curving inwards to meet the other clasper. The upper branch has an internal longitudinal ridge, armed with setae.

♀ GENITALIA. Ninth segment short above, lateral gonapophyses large, about three times as long as wide, directed obliquely downwards, base constricted. From beneath, they are somewhat sinuous. Subgenital plate broad, apex four-lobed, outer lobes much larger than inner, apices rounded. Tenth segment fused with ninth, cerci about half as long as lateral gonapophyses, slender, acute.

Length of fore wing, ♂, 8·5 mm., ♀, 9 mm.

Holotype ♂, Lake Awasa, 6.xi.1960 (*A. Tjønneland*), BMNH, mounted as microscope preparation.

Allotype ♀, Lake Awasa, 6.xi.1960 (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, abdomen mounted as a microscope preparation.

Paratypes, Lake Awasa, 6, 27.xi.1960, 12 ♂, 3 ♀; Koka Dam, 29.iii.1961, 1 ♂; Black River, near Lake Awasa, 15.iv.1961, 3 ♂, 2 ♀ (*A. Tjønneland*), BMNH, UCAA.

This species has been placed in the hitherto oriental genus *Tagalopsyche* on the general similarity of the venation and of the male and female genitalia. In the hind wing, fork Cu_{1a} is perhaps a little shorter than in the typical species, *T. sisyroides* Banks. I can see no spur on the anterior tibia, but I do not attach much importance to this, as the spur in *T. brunnea* (Ulmer) is very short. Male and female genitalia are also very similar to those in the genus *Mystacides*, from which it differs in the venation of the fore wing, fork R_2 being stalked, the discoidal cell being short, costal margin not notched nor the apex of the wing deflexed and the anastomosis is straight, not oblique. In male genital structure, *T. aethiopica* differs from *T. brunnea* in details of the claspers.

Oecetis pangana Navás

Kimmins, 1961 : 244–245, figs. 5–7.

Koka Dam, 29.iii.1961, 3 ♀; Ghibe River, 215 km. from Addis Ababa, 13–14.v. 1961, numerous ex. (*A. Tjønneland*) ; Ghibe River, 260 km. from Addis Ababa, 6.v.1961, a few ex. (*S. Chojnacky*).

Previous distribution : CONGO and SENEGAL.

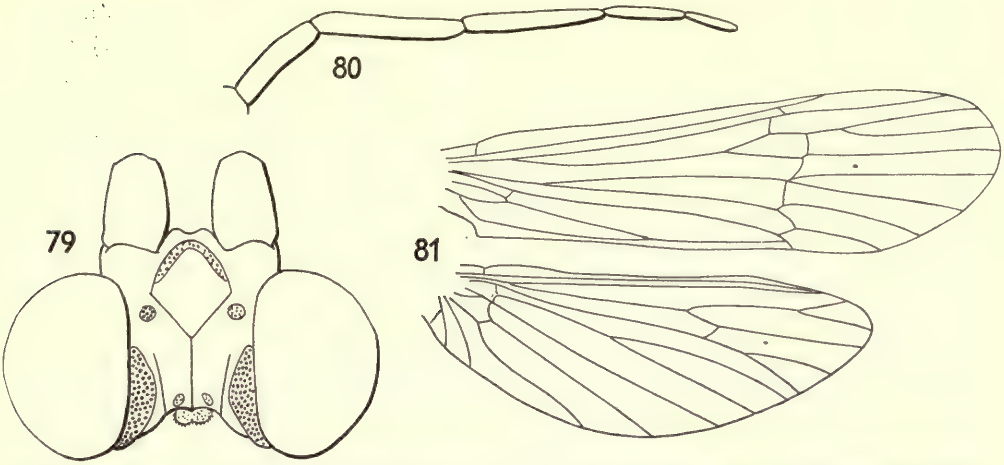
Oecetis setifera Ulmer

(Text-figs. 87–89)

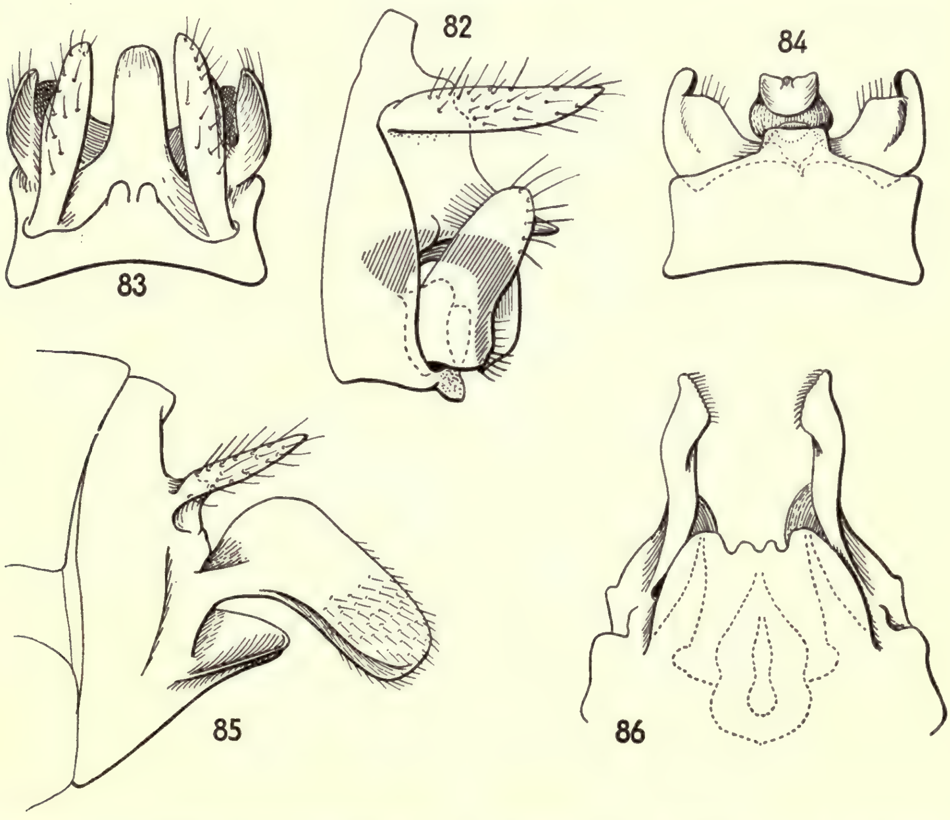
Ulmer, 1922 : 59–61, figs. 18–21a (Holotype ♂, Mus. A. Koenig, Bonn).
Oecetis choa Mosely, 1948a : 34–36, figs. 5–8, **syn. n.**, (Holotype ♂, BMNH).

Lake Awasa, 6, 27.xi.1960, numerous ex. ; Lake Margherita, 8–9.iv.1961, a few ex. (*A. Tjønneland*).

Oecetis choa Mosely was described from a single male, taken at Lake Nyasa.



FIGS. 79–81. *Tagalopsyche aethiopica* sp. n. ♂. 79, head, dorsal; 80, maxillary palpus; 81, wings.

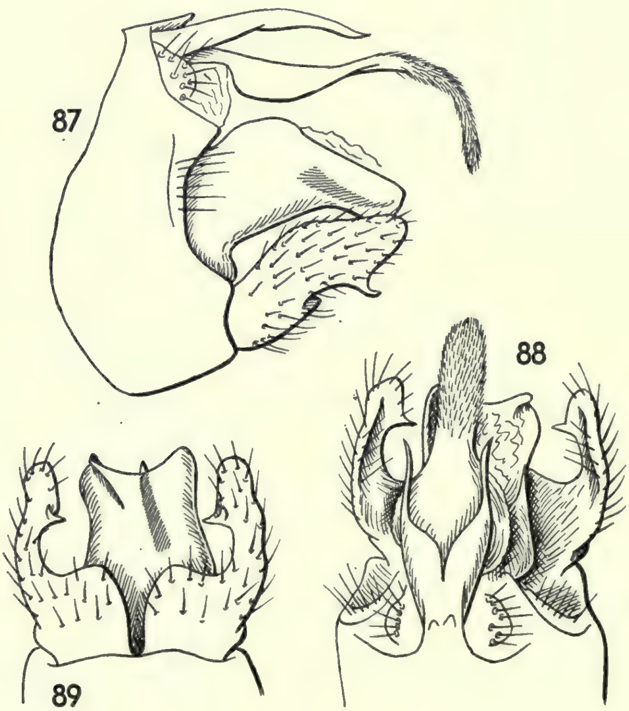


FIGS. 82–86. *Tagalopsyche aethiopica* sp. n. Genitalia. 82, ♂ lateral; 83, ♂ dorsal: 84, ♂ ventral; 85, ♀ lateral; 86, ♀ ventral.

Mosely comments on the similarity to *O. setifera* Ulmer and distinguishes it from that species on the form of the aedeagus (lower penis-cover) and in having reticulated areas on the fifth to eighth tergites only. Since then I have seen material from other localities, all agreeing with *O. choa* in the arrangement of the reticulated areas on the tergites, but with the male genitalia more like *setifera* (apart from the form of the aedeagus). Recently, Dr. B. Mannheims, of the Museum A. Koenig, Bonn, has been kind enough to send me the type of *O. setifera* Ulmer for study. This has revealed that there are in fact reticulated areas on four tergites only, the fifth to the eighth, and that the genitalia are identical with specimens from Ethiopia. The genitalia differ slightly from those of *O. choa*, but the difference is insufficient to be of specific importance.

I take this opportunity to designate as LECTOTYPE of *Oecetis setifera* Ulmer the first male listed by him, labelled " Gebel Ain (Bahr el Abiad), 18.ii.1913 ", " Oecetis setifera Ulm." and my own lectotype label. The specimen is in alcohol, in the Museum A. Koenig, Bonn. New figures of the male genitalia are given, from Ethiopian material.

Distribution : Ulmer's types were from the EGYPTIAN SUDAN, the type of *O. choa* Mosely was from LAKE NYASA and I have seen other examples from LAKE VICTORIA.



FIGS. 87–89. *Oecetis setifera* Ulmer, ♂ genitalia. 87, lateral ; 88, dorsal ; 89, claspers and aedeagus, ventral.

Oecetis montana Ulmer

(Text-figs. 90–91)

Ulmer, 1930 : 495–497, figs. 18–19 (Holotype ♀, Ethiopia, BMNH).

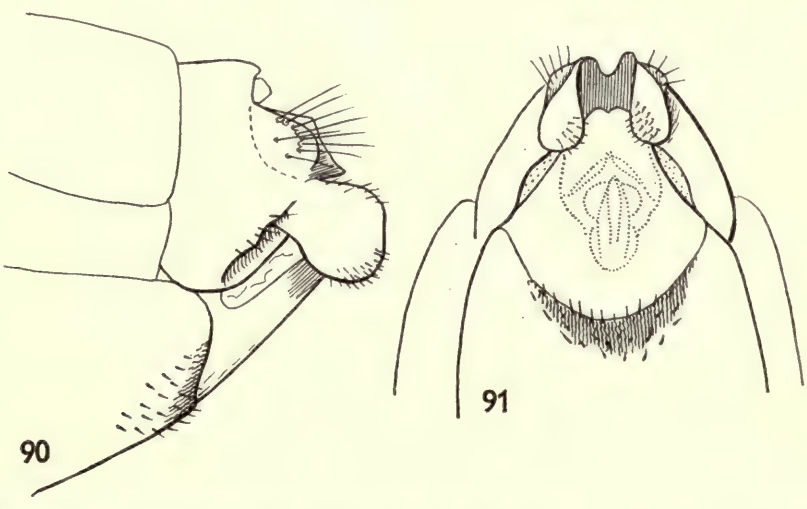
The abdomen of the holotype has been removed and cleared in KOH solution, to enable a new description and figures to be made. Eighth sternite with its apical margin concave, rather strongly pigmented and bearing a number of widely-spaced, short setae. Ninth tergite more or less fused with the tenth, the cerci represented by rounded lobes on each side of the tubular tenth segment, which is obliquely truncate in side view, ventral margin excised. Lateral gonapophyses somewhat pyriform in side view, convex on outer surfaces, apices incurved. Subgenital plate directed obliquely upward between the lateral gonapophyses, in ventral view tapering to a narrow, slightly bilobed apex. Internal structures as indicated in figures.

Oecetis tjonnelandi sp. n.

(Text-figs. 92–94)

(In alcohol.) Head medium fuscous, rather darker on occiput and paler on face. Antennae pale fuscous, articulations darker. Palpi dark fuscous, with fuscous pubescence. Thorax above warm brown, with paler markings. Legs pale fuscous. Fore wing pale fuscous, with darker markings over the anastomosis and main forks. Hind wing smoky hyaline, with fuscous veins. Both wings with sparse fuscous pubescence (possibly denuded), anal fringe of hind wing long and piceous. Venation as in *O. setifera* Ulmer. Reticulated areas on fifth to eighth abdominal tergites.

♂ Genitalia. Ninth and tenth tergites fused, the centre of the dorsal apical margin produced in a pair of slender, adjacent spines, clothed with fine setae apically. Side-pieces of ninth segment short, serrate and setose. Aedeagus stout, cylindrical at base, open dorsally towards apex and filled with membrane. It is slightly asymmetric, the left lateral margin being curved outward. Apex bilobed. Clasper in side view short, quadrate, with a brief finger on upper apical angle



Figs. 90–91. *Oecetis montana* Ulmer, genitalia of ♀ type. 90, lateral ; 91, ventral.

and with a long, curved spine arising from the upper basal angle. The spine is directed basally at first, then arched over caudad and downward. From beneath, the clasper is broad basally, the upper outer margin curving outwards, the inner margin tapering sinuously towards the apex, and with a strong, pre-apical spine directed medially.

Length of fore wing, ♂, 6 mm.

Holotype ♂, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

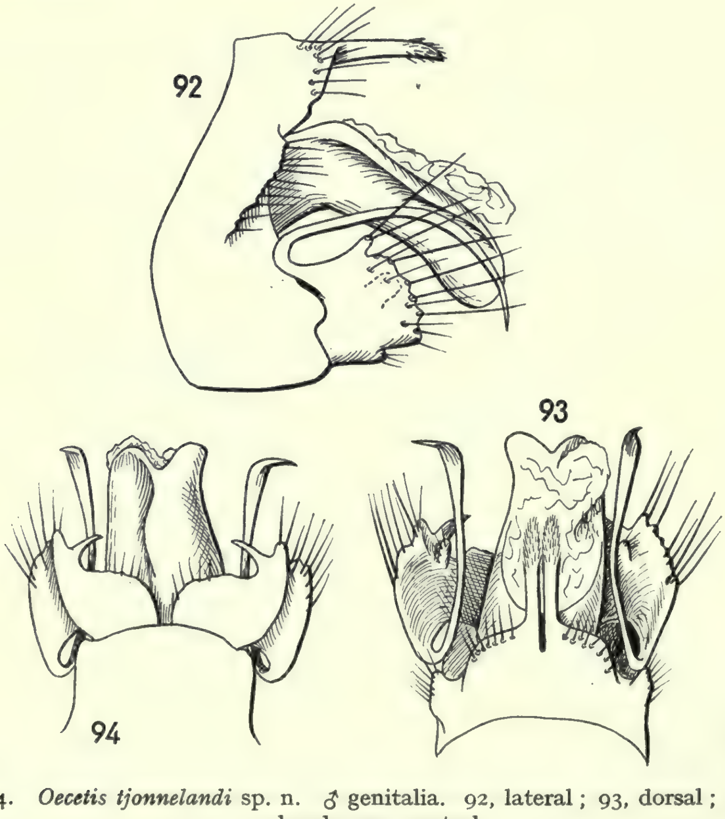
Paratypes, Ghibe River, 260 km. from Addis Ababa, 6.v.1961, 3 ♂ (*S. Chojnacky*) ; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 3 ♂ (*A. Tjønneland*), BMNH, UCAA.

The presence of reticulated areas on the fifth to eighth tergites of the male shows a relationship to *O. setifera* Ulmer and *O. reticulatella* Kimmins. The clasper, although very different in side view, has a pre-apical spine similar to that of *O. setifera* and the shape of the clasper in ventral view also recalls that species.

Oecetis brunnescens (Ulmer)

Lake Awasa, 6, 27.xi.1960, numerous ex. (*A. Tjønneland*).

Previous distribution : Egyptian Sudan.



Figs. 92–94. *Oecetis tjonnelandi* sp. n. ♂ genitalia. 92, lateral ; 93, dorsal ; 94, claspers and aedeagus, ventral.

Oecetis ghibensis sp. n.

(Text-figs. 95–101)

(In alcohol.) Head dark brown, antennae pale fulvous, with fine piceous annulations, the two basal segments fuscous. Maxillary palpi fuscous, with fuscous pubescence, labial palpi paler. Thorax dark brown, legs pale fuscous. Wings largely denuded, membrane of fore wing shaded with fuscous in basal third, from C to Cu_{1a}; cross-veins of anastomosis, forks of Rs, $M\text{-}Cu$ and Cu_1 shaded with fuscous, as are apices of veins. Hind wing faintly smoky. In fore wing, the discoidal cell is distinctly longer than its footstalk, about equal to median cell. The cross-vein closing the discoidal cell is oblique, its posterior end nearer to apex. Abdomen pale fuscous above, the fuscous marking becoming obsolete on terminal segments.

♂ Genitalia. Ninth segment short, side-pieces only slightly produced. Tenth segment and cerci fused, forming a short hood, the tenth segment projecting beyond the cerci in a slightly sclerotized lobe, excised to form a wide V in dorsal view, appearing as a short, rounded lobe in side view. Aedeagus somewhat globular, its apex extended in a short, slightly curved finger in side view. Within the aedeagus is a single spine. Clasper broad and flattened in ventral view, outer margin convex, with a shoulder before the spatulate apex, inner margin sinuous. In side view, the clasper is almost straight, the shoulder appearing as a small triangular projection on upper margin.

♀ genitalia. Eighth sternite with a concave, transverse band of pigmentation towards the apex. Subgenital plate broadly cordate. Ninth tergite short and deep. Lateral gonapophyses longer than ninth tergite, directed downwards and outwards, so that the outer surface is concave, upper and lower angles rounded. Cerci fused to tenth segment, forming the dorsal surface of a hood, whose apex is bent downwards and projects caudad.

Length of fore wing, ♂, 7 mm., ♀ 6·5 mm.

Holotype ♂, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Paratypes, Koka Dam, 29.iii.1960, 1 ♂; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 21 ♂, 6 ♀ (*A. Tjønneland*), BMNH, UCAA.

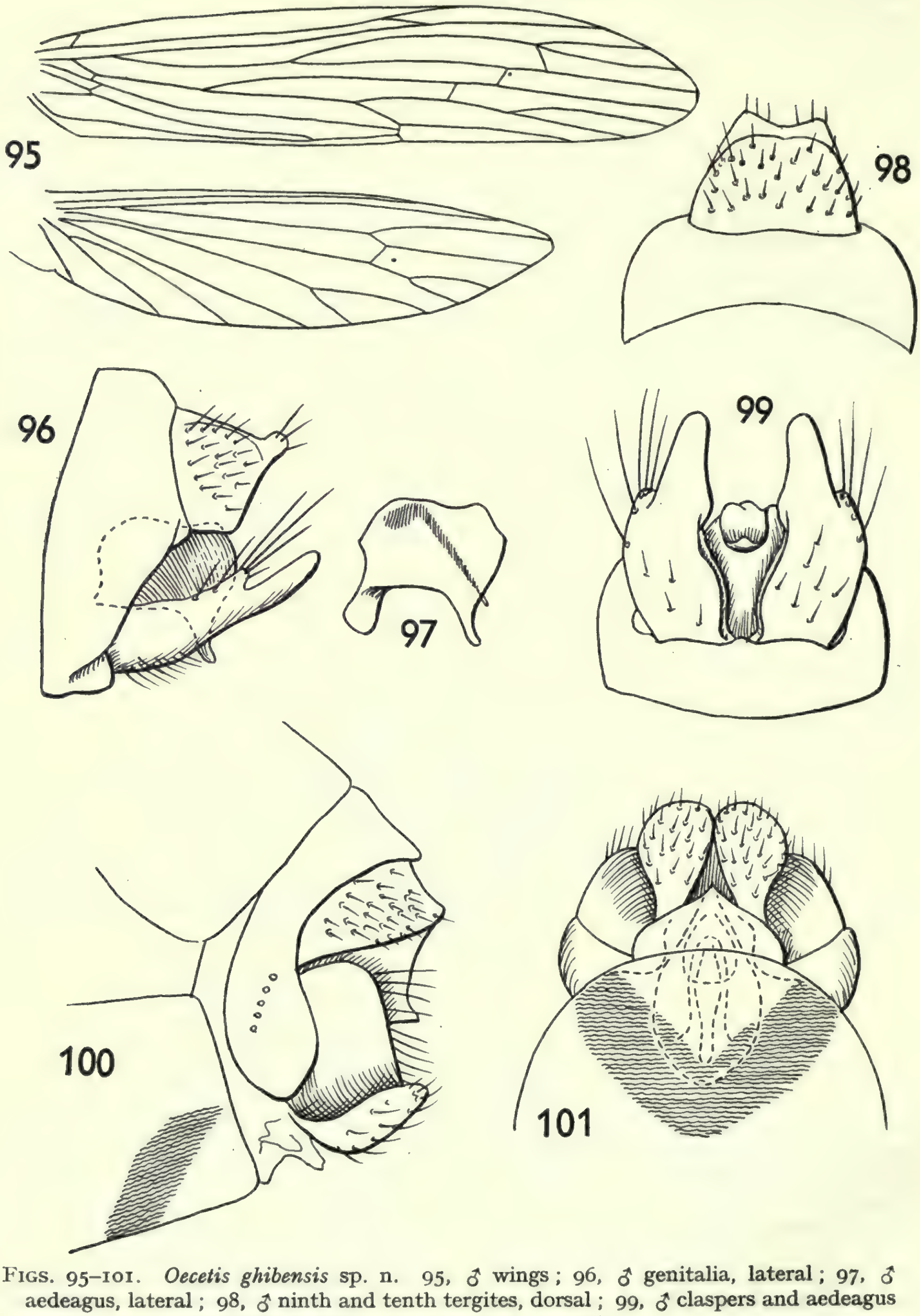
This species is related to *O. lucipetens* Barnard, from South Africa. It differs in the longer discoidal cell in the fore wing, the broader apex to the tenth segment and larger cerci in the male and narrower apex of the aedeagus. The female is associated with the male on the evidence of the wing venation. The genitalia show some resemblance to those of *O. ovampoensis* Barnard.

Oecetis brevis sp. n.

(Text-figs. 102–107)

(In alcohol.) Head pale fuscous, vertex slightly darker. Antennae finely annulated with piceous at articulations. Palpi pale fuscous, with fuscous pubescence. Thorax yellowish brown, legs pale fuscous. Fore wing pale fuscous, rather denuded, but with traces of fuscous pubescence. Cross-veins of anastomosis shaded with fuscous. Hind wing pale smoky hyaline. In fore wing, the bases of the discoidal and median cells are at approximately the same level, anastomosis forming an almost straight line. Apical cells long and narrow.

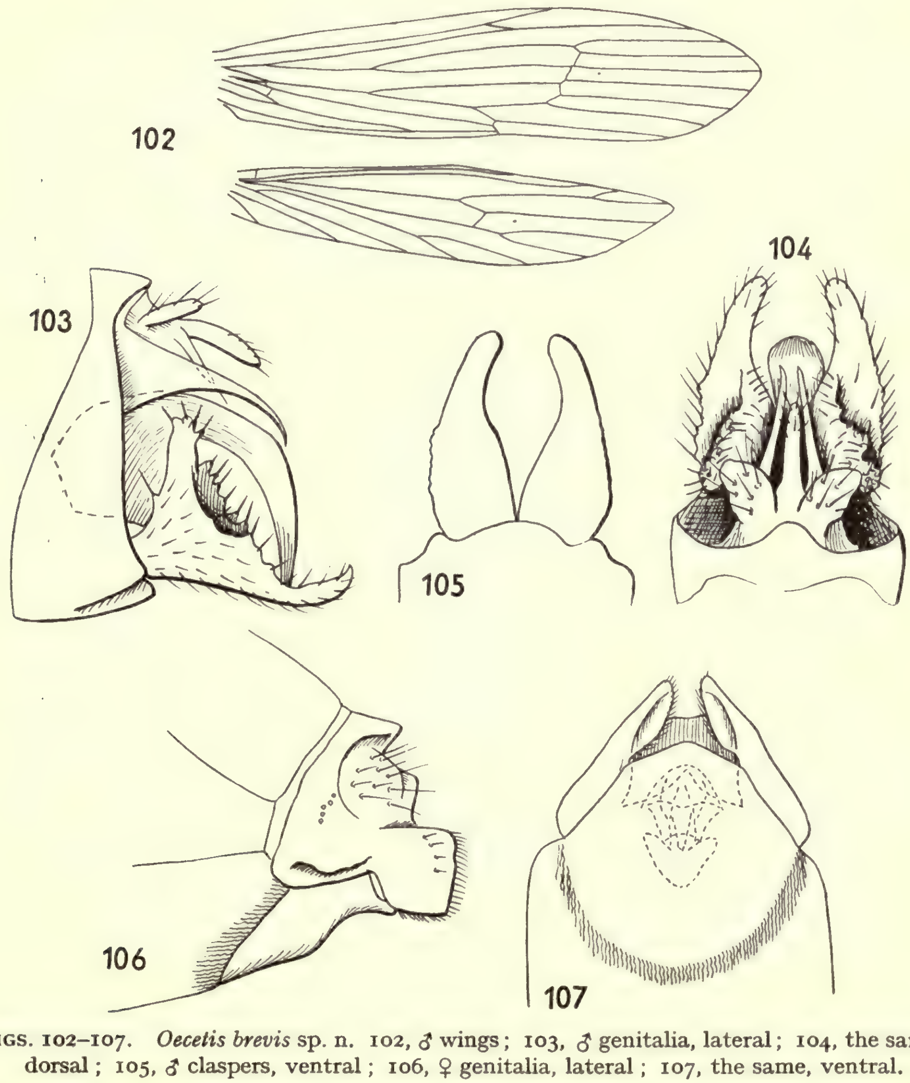
♂ genitalia. Ninth segment rather narrow above, the centre of the apical produced in a small, rounded lobe. No obvious side-pieces. Tenth segment partly fused to ninth, trilobed, the median lobe slender and digitate, shorter than the lateral lobes, which form slender, down-curving spines, placed above the aedeagus. On either side of the median lobe is a slender,



FIGS. 95–101. *Oecetis ghibensis* sp. n. 95, ♂ wings; 96, ♂ genitalia, lateral; 97, ♂ aedeagus, lateral; 98, ♂ ninth and tenth tergites, dorsal; 99, ♂ claspers and aedeagus ventral; 100, ♀ genitalia, lateral; 101, the same, ventral.

transparent finger, terminating in a bristle. These fingers are not visible from above. Aedeagus stout basally, curving downwards in a tapering spine. Clasper shorter and broader than in related species, the upwardly directed basal branch with an inner ridge paralleling the upper margin of the clasper, both the basal branch and its inner ridge heavily clothed with short spines arising from elevated bases. Apex of clasper slender, slightly upcurved and acute in lateral aspect.

♀ Genitalia. Eighth segment with apical margin excised and pigmented, subgenital plate broad and tapering to an obtuse apex, lateral margins angled. Ninth segment of moderate length, apical dorsal margin produced in the centre in a rounded lobe. Cerci appearing as slightly convex plates fused to the anal tube, which extends slightly beyond them. Lateral gonapophyses more or less quadrate in side view, lower margin slightly incurved in ventral view. Within the base of the abdomen can be seen a large oval sac, connected with the genital area by a



Figs. 102–107. *Oecetis brevis* sp. n. 102, ♂ wings; 103, ♂ genitalia, lateral; 104, the same, dorsal; 105, ♂ claspers, ventral; 106, ♀ genitalia, lateral; 107, the same, ventral.

long, tapering, convoluted tube. The actual point of attachment is obscure. The surface of the sac is densely and finely pitted, the pits appearing dark in uncleared specimens.

Length of fore wing, ♂, 6·5 mm., ♀, 5 mm.

Holotype ♂, Ghibe River, 260 km. from Addis Ababa, 6.v.1961 (*S. Chojnacky*), BMNH, mounted as microscope preparations.

Allotype ♀, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, abdomen mounted as microscope preparation.

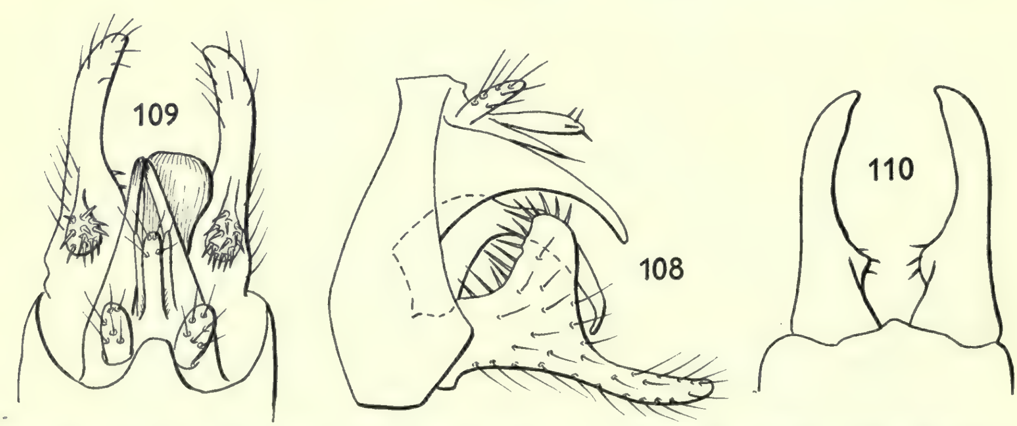
Paratypes, Ghibe River, 260 km. from Addis Ababa, 6.v.1961, 1 ♂ (*S. Chojnacky*); Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 3 ♂, 3 ♀ (*A. Tjønneland*), BMNH, UCAA.

This species clearly belongs to the *modesta* group of species and comes closest to *O. acuta* Ulmer (Natal). The description and figure of the genitalia of *O. acuta* give no indication of a basal branch to the clasper and I am therefore giving new figures from the type (Text-figs. 108–110). In *brevis* the outer lobes of the tenth segment are narrower basally, the aedeagus is relatively longer and more evenly curved. The basal branch of the clasper is narrower at its apex and more serrate in its outline, and in ventral view the basal part of the clasper is broader. In the female presumed to be that of *brevis*, the genitalia resemble those of *O. montana* Ulmer, but differ in the shape of the lateral gonapophyses, the subgenital plate and the internal structure.

Oecetis spp. ♀

In the absence of any correlated males, the following specimens have not been determined beyond the genus.

Dawa River, 12 km. N. of Hudat, 12.iv.1961, 1 ♀ (*A. Tjønneland*); Ghibe River, 260 km. from Addis Ababa, 6.v.1961, 4 ♀ (*S. Chojnacky*); Gamo Prov., Gughé



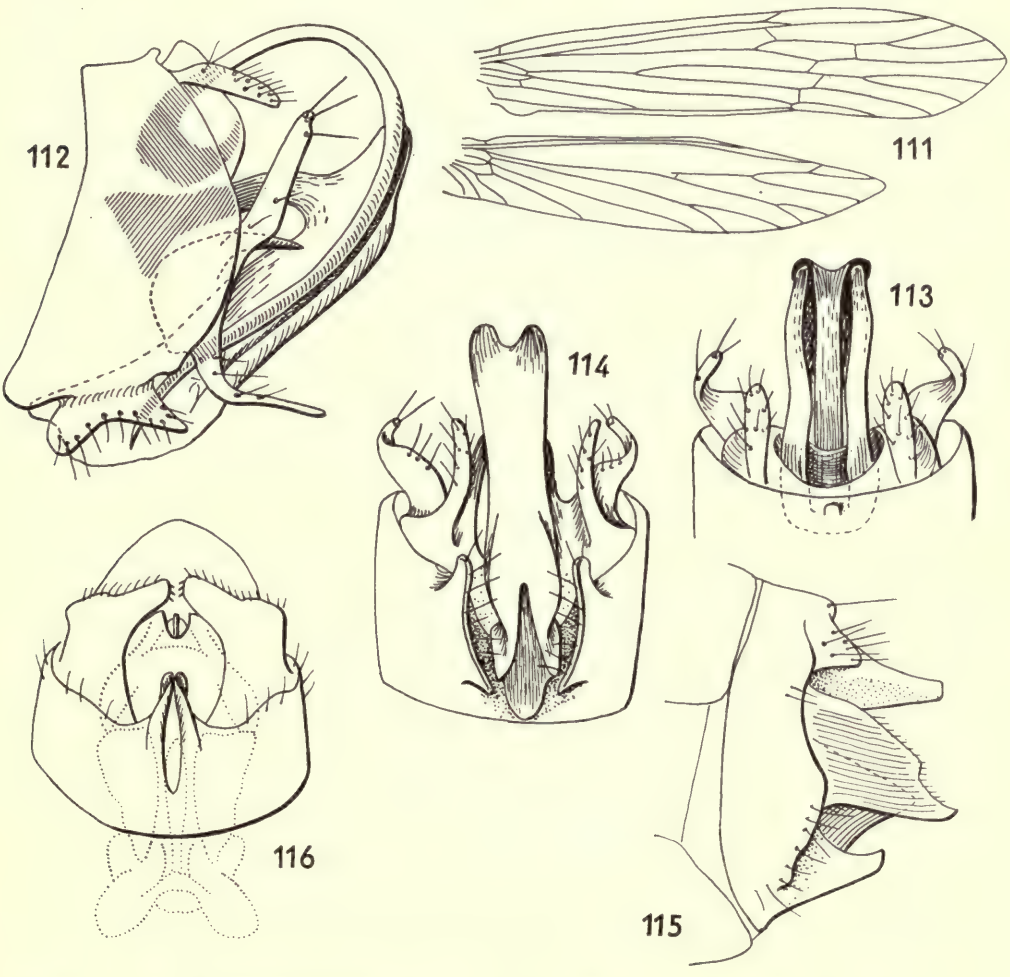
FIGS. 108–110. *Oecetis acuta* Ulmer, genitalia of ♂ type. 108, lateral; 109, the same, dorsal; 110, claspers, ventral.

Highlands, Bonghé, c. 9,000 ft., 29.xii.1948, 1 ♀ (*H. Scott*) ; Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 2 ♀ (*A. Tjønneland*) ; these two females appear to be different species, either of which might be the female of *O. tjonnelandi* Kimmins.

***Setodes aethiopica* sp. n.**

(Text-figs. 111–116)

The specimens were collected at light and preserved in alcohol. Little can be said of their general appearance, since the wings are almost completely denuded. The general colour of the head and thorax is a pale cream, tinged with brownish.



FIGS. 111–116. *Setodes aethiopica* sp. n. 111, ♂ wings ; 112, ♂ genitalia, lateral ; 113, the same, dorsal ; 114, the same, ventral ; 115, ♀, genitalia, lateral ; 116, the same, ventral.

Antennae pale cream, finely annulated with reddish at the articulations, palpi whitish. Legs whitish, spurs 0.2.2. Fore wing faintly tinged with brownish, with faint, hyaline, longitudinal lines between some of the main veins, suggesting that the wing may have streaks of whitish or silver pubescence. Hind wing hyaline. Venation as in Text-fig. 111. Abdomen whitish, terminal segments cream.

♂ GENITALIA similar in pattern to *S. alala* Mosely and *S. excisa* Kimmins. Ninth segment with a small, quadrate process projecting from near the centre of the apical margin. Ventrally the ninth segment has a deep median depression, the lateral margins of the depression each produced ventrally in a thin, bifid plate. Between these produced lateral margins of the depression are partially concealed the apex of the aedeagus and the tips of the lateral spines of the tenth segment. The tenth segment appears to form a short anal tube, from the outside of which arise the short, digitate cerci. From within the tube arise a pair of very long, slender spines, directed caudad and recurved downward and cephalad on each side of the aedeagus, the apices resting, as previously mentioned in the median depression of the ninth sternite. The aedeagus is slender in its basal third and then bent sharply downwards and cephalad. At the point of bending, the dorsal surface is elevated and produced outwards to form a groove on each side of the stem in which the apical half of the spines of the tenth segment rest. This raised part of the aedeagus also has a median groove on its dorsal surface. Seen from beneath, the dorsal apical margin of the aedeagus has a deep V-shaped excision, the ventral apical margin being spatulate. Clasper from the side partly concealed by the margin of the ninth segment, divided into three slender branches, one directed upwards and curving inwards, the second, arising near its base on the inner surface, forms a short, curved spine, directed caudad. The third and most slender branch is directed downward and then caudad and slightly outward.

♀ GENITALIA. Ninth segment synscleritous, its ventral apical margin produced in a pair of thin plates, triangular in side view, with truncate apices, separated by a narrow excision in ventral view. Tenth tergite forming a thin, convex hood, its apex rounded in ventral view, truncate in side view. Cerci short, triangular. Lateral gonapophyses thin and plate-like, somewhat triangular in side-view, apices incurved in ventral view. Between the gonapophyses in ventral view can be seen a rounded plate with a U-shaped median excision, and within the excision a smaller rounded plate bearing a slender, median finger.

Length of fore wing, ♂, 4·8 mm., ♀, 4·4 mm.

Holotype ♂, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Paratypes, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, numerous ex., ♂, ♀, (*A. Tjønneland*), BMNH, UCAA.

This species is clearly allied to *S. alala* Mosely from SW. Arabia. The genitalia in both sexes are of the same general pattern, and the pigmentation of the fore wing suggests that this wing formerly bore a similar pattern of silver or white lines on a yellowish ground. The male genitalia differ in the more strongly arched aedeagus, whose dorsal surface is elevated and produced laterally to provide grooves for the spines of the tenth tergite. The clasper is reduced to three slender branches and the lateral margins of the median ventral depression of the ninth segment are produced in bilobed plates. In the female, the apical margin of the tenth segment is entire, the lateral gonapophyses are triangular in side view and the two ventral processes of the ninth segment are closer together.

Setodes pallida sp. n.

(Text-figs. 117–121)

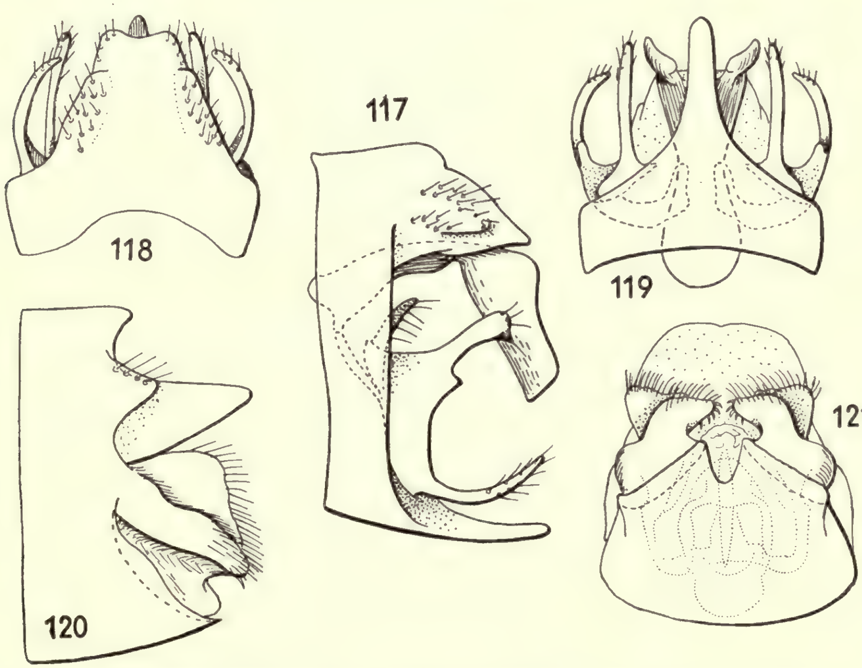
Specimens preserved in alcohol and much rubbed, wings with traces of yellowish pubescence. General colour creamy white, eyes purplish black. Spurs 0.2.2. Wing venation as in *S. trifida* Kimmins.

♂ GENITALIA. Ninth segment laterally compressed, its width about two-thirds of its height. Apical ventral margin produced in a long, tapering median process. Tenth segment fused to ninth, forming a dorsal hood, tapering to an acute apex in side view, truncate and shallowly excised in dorsal view. Near the base on each side is a low, setiferous wart, possibly a reduced cercus. Aedeagus slender basally in side view, abruptly angled downwards about midway, dilated, the apex excised and diverging laterally. Clasper with three slender branches ; a short one below the aedeagus ; an outer one, arising from a broad base and curving inwards and a ventral branch, curving upwards and about as long as the ventral process of the ninth segment.

♀ GENITALIA. Ninth segment synscleritous. Dorsal apical margin produced in a small triangular lobe ; ventral apical margin triangularly produced, with a U-shaped apical excision. Tenth segment forming a thin and broad rounded plate, its lateral margins deflexed so that it appears triangular in side view. On each side at the base is a triangular, setiferous lobe. Lateral gonaphyses in the form of two overlapping, fringed plates, the outer one narrower than the inner, incurved and dentate apically.

Length of fore wing, ♂, 6·7 mm., ♀, 5·4 mm.

Holotype ♂, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, (*A. Tjønneland*), BMNH, mounted as microscope preparations.



FIGS. 117–121. *Setodes pallida* sp. n. 117, ♂ genitalia, lateral ; 118, the same, dorsal ; 119, the same, ventral ; 120, ♀ genitalia, lateral ; 121, the same ventral.

Allotype ♀, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, abdomen mounted as a microscope preparation.

Paratypes, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 16 ♂, 27 ♀, (*A. Tjønneland*), BMNH, UCAA.

This species is allied to *S. trifida* Kimmins, from Kenya, in the general pattern of male and female genitalia. In the male, it may be distinguished by the more triangular tenth segment, with a truncate apex in dorsal view, the much shorter upper and the more slender, digitate lower branch of the clasper, and the strongly produced ventral process of the ninth sternite. The female differs in the more broadly triangular shape of the tenth segment in lateral view, the lateral gonapophyses and the narrower excision of the ninth sternite.

Setodes squamosa Mosely

Koka Dam, 29.iii.1961, a few ex. (*A. Tjønneland*).
Previous distribution : NATAL.

Trichosetodes tjonnelandi **sp. n.**

(Text-figs. 122–127)

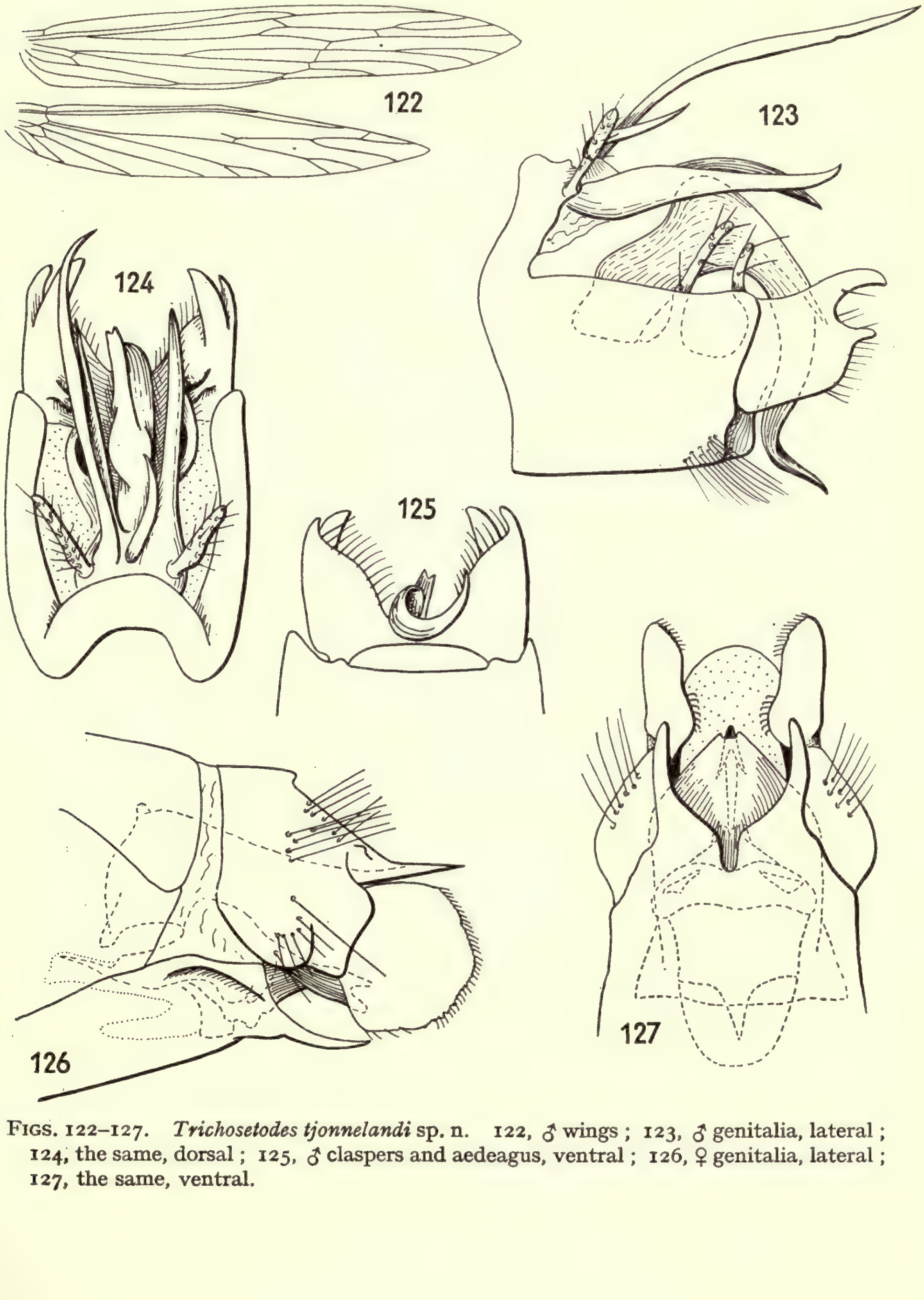
The specimens were collected in alcohol and are considerably denuded. Head tawny, probably with a pair of narrow lines of white hairs running back from the antennae. The latter are tawny, the long basal segment with traces of scale-like hairs and, in the ♂, a terminal tuft of fine hairs, the succeeding segments finely annulated with reddish apically. Palpi tawny, with sparse fuscous pubescence. Thorax fuscous above, with pale warts and a pair of parallel, longitudinal, pale lines, bearing traces of white, scale-like hairs, on the mesonotum. Legs luteous, with sparse fuscous pubescence. Wings narrow, membrane of fore wing pale fuscous, with traces of fuscous pubescence and narrow scale-like hairs. Abdomen creamy, terminal segments tawny.

♂ GENITALIA. Ninth segment long ventrally, cut back dorsally to a short, transverse band. Tenth segment short, giving rise to two pairs of spines, the cerci slender, short and more or less erect. The inner pair of spines are very asymmetric, the left one short, directed upwards and then sharply angled caudad. The right-hand spine is very long and slender, extending caudad beyond the apices of the claspers. The outer pair of spines are only slightly asymmetric, stouter than the inner pair and not reaching as far as the apices of the claspers. Aedeagus strongly arched downwards, its upper surface humped at the angle. It is obscurely divided into a short upper spine, tapering to an excised apex and a much longer lower spine, which extends ventrally between the claspers and is twisted spirally towards the apex. The claspers are roughly quadrate in side view, the upper apical angle produced in a tapering finger curving slightly inwards and downwards. Below this finger is a shorter process, also slightly incurved. From beneath, the clasper is subtriangular, the inner margin sinuous. From the basal part of the clasper arise two slender, digitate processes, directed upwards beside the aedeagus.

♀ GENITALIA. The ninth tergite forms a large saddle, with the tenth tergite fused to it and projecting in a thin plate with a rounded apex. Lateral gonapophyses rounded and plate-like, fringed with short setae and with a group of hooked setae on inner surface at ventral angle.

Eighth sternite produced in a subgenital plate, which is widely and deeply excised at its apical margin, the sides of the excision sinuously curved so that the base of the excision is narrow and parallel sided. The apices of the subgenital plate form slender fingers. Above this excision is a thin, triangular plate with a narrow excised apex. Vaginal structure strongly sclerotized and fused to a conspicuous cylindrical structure.

Length of fore wing, ♂, 5·8–6·2 mm., ♀, 5–5·6 mm.



FIGS. 122–127. *Trichosetodes tjonnelandi* sp. n. 122, ♂ wings; 123, ♂ genitalia, lateral; 124, the same, dorsal; 125, ♂ claspers and aedeagus, ventral; 126, ♀ genitalia, lateral; 127, the same, ventral.

Holotype ♂, Koka Dam, 29.iii.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Koka Dam, 29.iii.1961 (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, abdomen mounted as microscope preparation.

Paratypes, Koka Dam, 29.iii.1961, 4 ♂, 3 ♀ (*A. Tjønneland*), BMNH, UCAA.

The male somewhat resembles *T. semibrunnea* Ulmer in genitalia, but differs in having four, instead of two, spines arising from the tenth segment, the aedeagus is more sinuous and with a spiral apex and the clasper has two branches along the upper margin near the base. There is no second branch on the ventral margin and the form of the apical processes is different. The female resembles *T. anysa* Mosely in having an excised subgenital plate, but the excision is much larger and the lateral processes are consequently larger. There is a smaller thin tenth tergite in *anysa*, not mentioned nor shown in the figures of that species.

Trichosetodes similis sp. n.

(Text-figs. 128–133)

Insects collected in alcohol. In general appearance closely resembling *T. tjonnelandi* but smaller, and separable from that species by differences in the male and female genitalia.

♂ GENITALIA. Tenth tergite produced in two pairs of asymmetric spines. The left-hand spine of the inner pair about half as long as the right-hand one, slender and arched, right-hand spine extending beyond apices of claspers. Outer pair of spines rather longer than in *tjonnelandi*, the right-hand spine also exceeding the apices of the claspers. Cerci rather stouter in side view, flattened laterally. Aedeagus less stout at base than in *tjonnelandi*, directed upwards in side view and arching downwards between the claspers. It is similarly divided into a short upper and a long lower spine. The apex of the spine is less spirally curved. Claspers in side view longer and narrower, the upper apical branch directed obliquely upward, the lower branch either simple or cleft. The lower margin of the clasper is sinuous rather than convex.

♀ GENITALIA. Externally rather similar in structure. The tenth tergite is shorter and slightly angled upwards in side view. The lateral gonapophyses are rather more pyriform in side view. The produced angles of the subgenital plate are not so far apart and the base of the excision between them is not further deepened by a narrow, U-shaped excision. Internally there are very noticeable differences in the vaginal structure.

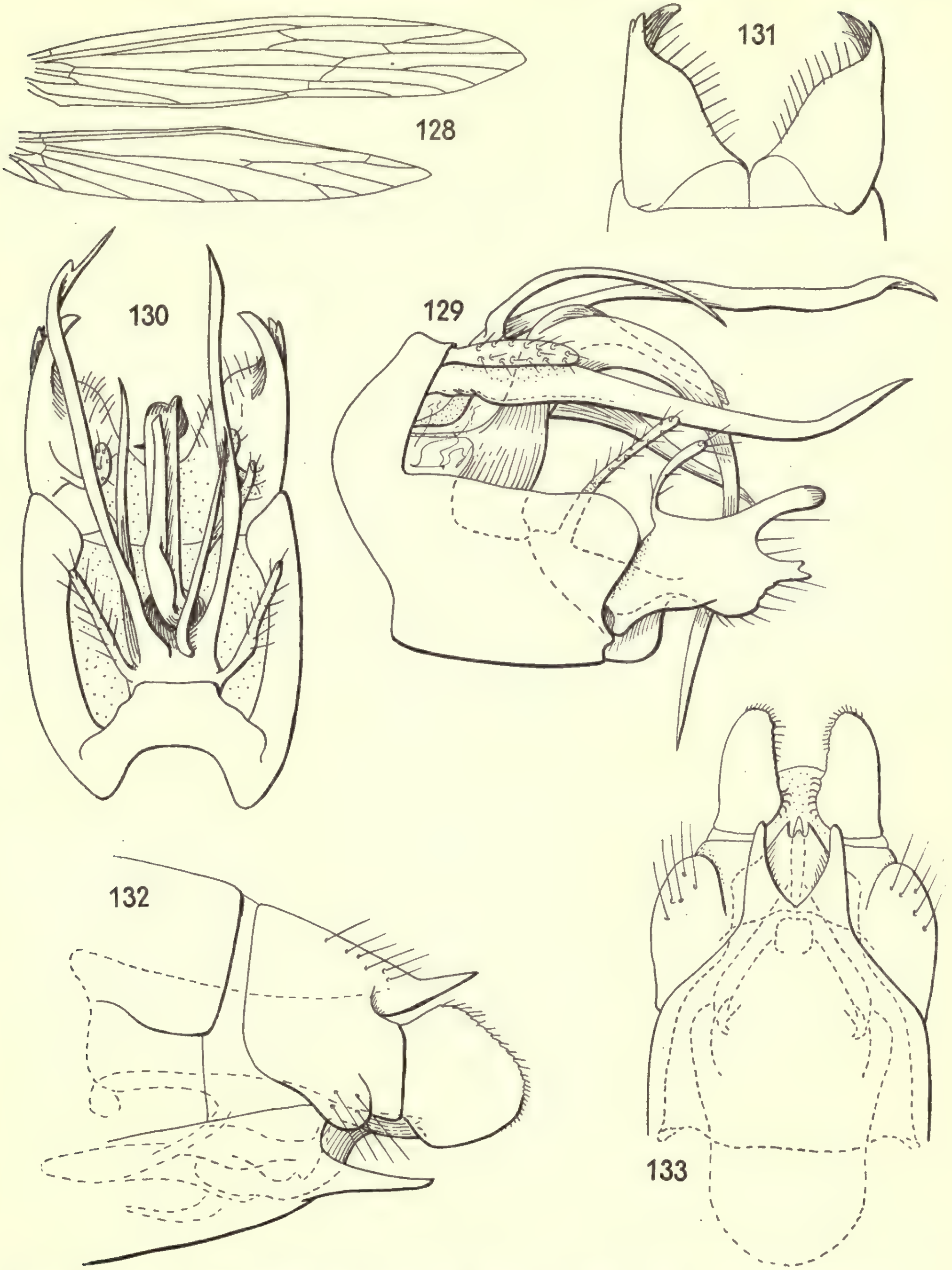
Length of fore wing, ♂, 4·8 mm., ♀, 4·7 mm.

Holotype ♂, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961 (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, abdomen mounted as microscope preparation.

Paratypes, Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 12 ♂, 8 ♀ (*A. Tjønneland*), BMNH, UCAA.

This species is closely related to *T. tjonnelandi* sp. n. and had there been only a single male available, one might perhaps have considered it as a variation of that species. Since there are also differences in the female sex, it seems preferable to treat the Ghibe River specimens as a distinct species. The differences between the two are detailed in the above description.



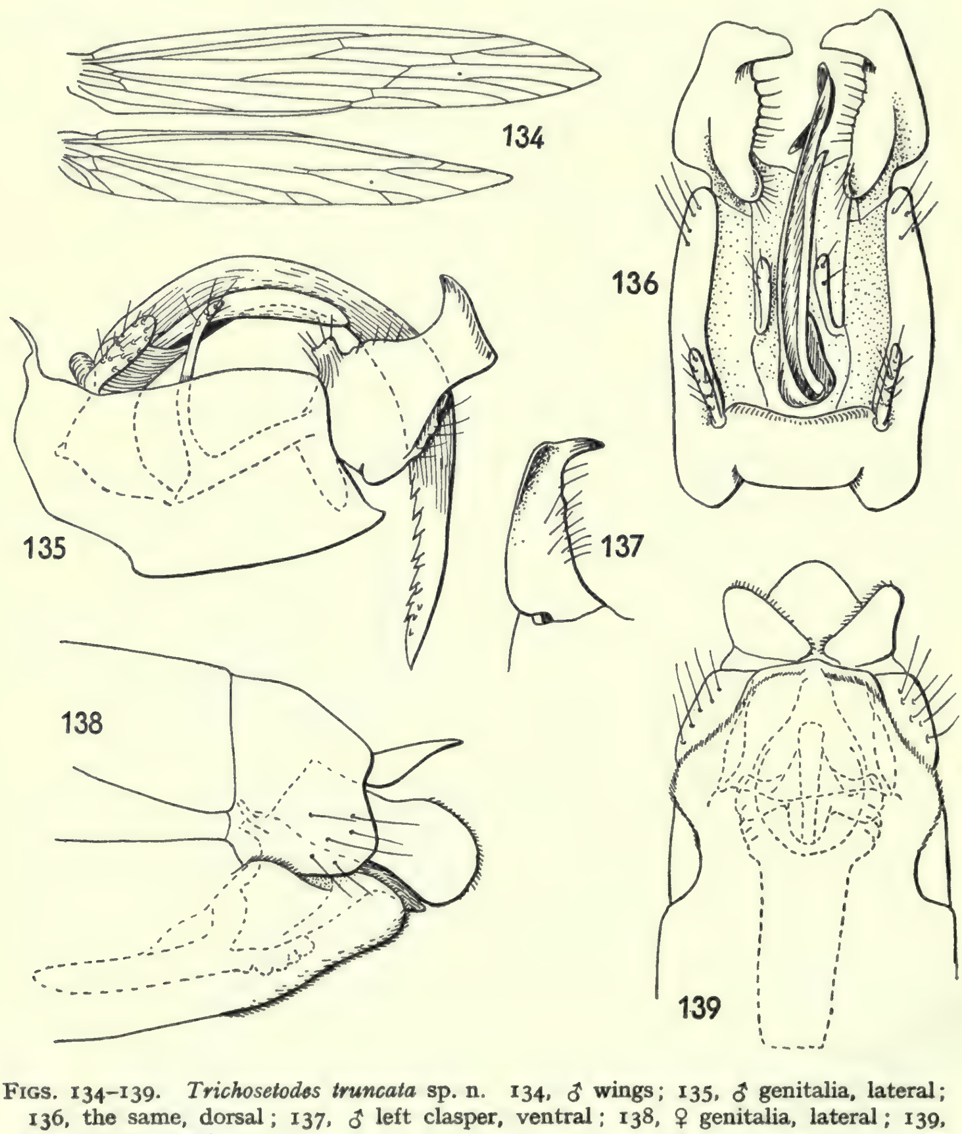
FIGS. 128–133. *Trichosetodes similis* sp. n. 128, ♂ wings; 129, ♂ genitalia, lateral; 130, the same dorsal; 131, ♂ claspers, ventral; 132, ♀ genitalia, lateral; 133, the same, ventral.

Trichosetodes truncata sp. n.

(Text-figs. 134–139)

Insects collected in alcohol and much denuded. Yellowish brown, head and thorax with traces of a silver line on inner side of basal segment of antenna and of two longitudinal lines of silver scale-like hairs. Wings pale fuscous, with traces of white or silver longitudinal streaks.

♂ GENITALIA. Ninth segment cut back dorsally to a narrow transverse band, its posterior margin extended upwards in a thin transverse plate. Apical margin of ninth sternite with a small, median excision. Tenth segment reduced to a transverse rib, carrying the short, laterally



FIGS. 134–139. *Trichosetodes truncata* sp. n. 134, ♂ wings; 135, ♂ genitalia, lateral; 136, the same, dorsal; 137, ♂ left clasper, ventral; 138, ♀ genitalia, lateral; 139, the same, ventral.

compressed cerci. There are no processes arising from the tenth segment. Aedeagus long, laterally compressed into a curved, sword-like structure, arching downwards, its lower margin near the apex strongly serrate. From near its base arises a short, curved spine, running adjacent to the main structure. Clasper short, stout at base, with a small, quadrate lobe on its upper margin near the base. The clasper tapers to near the apex, which is truncate and with the upper angle extended upwards and inwards in a stout spine.

♀ GENITALIA. Eighth sternite produced in a large subgenital plate, extending beyond the ninth tergite, broad at its base, tapering to a truncate apex, the whole surface densely set with minute setae. Ninth tergite with rounded lateral angles. Lateral gonapophyses rounded in side view, slightly constricted basally, ventral angles internally with a group of stout setae. Tenth tergite with apical margin parabolic. Vaginal structure as figured.

Holotype ♂, Koka Dam, 29.iii.1961 (*A. Tjønneland*), BMNH, mounted as microscope preparations.

Allotype ♀, Koka Dam, 29.iii.1961 (*A. Tjønneland*), BMNH, in 2% formaldehyde solution, abdomen mounted on holotype slide.

Paratypes, Koka Dam, 29.iii.1961, 2 ♂, 2 ♀; Sokorro stream, Wodorro village, 22–23.iv.1961, 1 ♀ (*A. Tjønneland*), BMNH, UCAA.

This species differs from most of the described species of *Trichosetodes* in the absence of any spiniform processes in the tenth tergite, and in this respect resembles *T. meghawanabaya* Schmid (Ceylon), which also has the aedeagus serrate apically and the basal dorsal margin of the ninth segment elevated in a thin transverse plate. It differs from the Ceylanese species in the form of the clasper, and in the shorter, stouter cercus. In the female the entire apical margin of the subgenital plate distinguishes it from that in *T. anysa*, *T. tjonnelandi* and *T. similis*, where it is excised.

Trichosetodes lacustris **?** Kimmins

Trichosetodes lacustris Kimmins, 1953 : 278, figs. 7–8.
Trichosetodes victoriana Kimmins, 1956 : 139–141, fig. 15.
Trichosetodes lacustris Kimmins, 1957 : 36.

Ghibe River, 215 km. from Addis Ababa, 13–14.v.1961, 1 ♂ (*A. Tjønneland*).

This specimen is placed here with some doubt, pending the capture of more material. It differs in some respects from both *lacustris* and *victoriana*, but in view of the variability already observed in *lacustris*, it seems desirable to place this specimen provisionally as a variety of *T. lacustris*.

Leptocerus sp.

Sokorro stream, Wodorro village, 22–23.iv.1961, 1 ♂, 1 ♀ (*A. Tjønneland*).

The male clearly belongs to the *intricatus*-group and is rather like *L. rectus* Kimmins. In view of the limited material, it seems wiser not to express an opinion as to its identity. Several species have already been described in this group, differing chiefly in the shape of the male claspers, and more material from each locality is desirable to determine the degree of variability.

Family LEPIDOSTOMATIDAE

Goerodes scotti (Ulmer)

Crunoeciella scotti Ulmer, 1930 : 497, figs. 20–22.

Gamo Prov., Bonghé, Gughé highlands, c. 9,000 ft., 29.xii.1948, 1 ♂, 1 ♀ (*H. Scott*) ; Wondo Abella, 24.iv.1960, 1 ♂ (*A. Tjønneland*) ; Dire Dawa distr., 5,000–8,000 ft., 1961, 3 ♂, 1 ♀ (*B. G. Hill*).

Previous distribution : ETHIOPIA.

LIST OF ETHIOPIAN TRICHOPTERA

* = Species recorded by Ulmer, 1930

	Distribution outside Ethiopia
PHILOPOTAMIDAE	
**Chimarra abyssinica* Banks	
lejea Mosely	Aden, Yemen
triangularis sp. n.	
POLYCENTROPODIDAE	
Dipseudopsis capensis Walker	African
PSYCHOMYIIDAE	
Ecnomus thomasseti Mosely	African
ugandanus Kimmins	Uganda, Tanganyika
hilli sp. n.	
similis Mosely	S. Africa, Nyasaland
Psychomyiellodes excavata sp. n.	
obscura Kimmins	Uganda, Rhodesia
Abaria electa Marlier	Congo
HYDROPSYCHIDAE	
Amphipsyche senegalensis (Brauer)	African
instabilis sp. n.	Rhodesia
fuscata sp. n.	
Cheumatopsyche sexfasciata (Ulmer)	W. Africa
* *bimaculata* (Ulmer)	
albomaculata (Ulmer)	W. Africa
simplex sp. n.	
* *obscurata* (Ulmer)	
* *falcifera* (Ulmer)	E. Africa
nubila sp. n.	S. Africa
* *afra* (Mosely)	African
Hydropsyche propinqua Ulmer	Cameroons
abyssinica sp. n.	
Diplectronella ? *afra* Mosely	

LEPTOCERIDAE

Pseudoleptocerus schoutedeni Navás	C. Africa, Sudan
corbeti Kimmins	Uganda
**Triaenodes triaenodiformis* (Ulmer)	N. Rhodesia
near *elegantula* Ulmer	
Parasetodes sudanensis Ulmer	Sudan, Uganda, Mozambique, Katanga
Athripsodes fissa (Ulmer)	African
jinjana Kimmins	Uganda
niveosquamosa sp. n.	
Leptocerina r. ramosa (Ulmer)	Cameroons
spinigera Mosely	W. Africa
talopa Mosely	Uganda
Tagalopsyche aethiopica sp. n.	
Oecetis pangana Navás	Congo, Senegal
setifera Ulmer	Sudan, L. Nyasa, L. Victoria
* *montana* Ulmer	
tjonnelandi sp. n.	
brunnescens (Ulmer)	Sudan
ghibensis sp. n.	
brevis sp. n.	
Setodes aethiopica sp. n.	
pallida sp. n.	
squamosa Mosely	Natal
Trichosetodes tjonnelandi sp. n.	
similis sp. n.	
truncata sp. n.	
? *lacustris* Kimmins	
Leptocerus sp.	

LEPIDOSTOMATIDAE

**Goerodes scotti* (Ulmer)	

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A NEW GENUS OF LIPTENINAE (LEPIDOPTERA : LYCAENIDAE)

H. STEMPFFER and N. H. BENNETT

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 13 No. 6
LONDON: 1963

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BY

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and

N. H. BENNETT

British Museum (Natural History)

Pp. 171–194 ; 55 *Text-figures*, 5 *Plates*

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A NEW GENUS OF LIPTENINAE (LEPIDOPTERA : LYCAENIDAE)

By H. STEMPFFER AND N. H. BENNETT

SYNOPSIS

A study of the genitalic affinities within the white *libyssa*-group of the genus *Liptena* has justified the erection of a new genus to contain five previously described species and fifteen newly-isolated species and subspecies which are described and figured hereunder.

IT has long been recognised that the genus *Liptena* Auctorum is a heterotypical one-containing as it does the *undularis*-group, *i.e.* the *Liptena* sensu stricto, the *libyssa*, group, the *tullia*-group, the *ideoides*-group and the *ilma*-group, the last-named already isolated by Karsch in the genus *Tetrarhanis*. In fact, each of these groups appears to merit generic status.

The *libyssa*-group is dealt with in this work. In 1898 Aurivillius in his *Rhopalocera Aethiopica*, designated *libyssa* Hewitson as type of the genus *Liptena*, but this action was invalidated as recently as 1959 by Opinion 566 of the International Commission on Zoological Nomenclature, which ruled that *undularis* Hewitson [1866] should be recognized as the type species, thus cancelling all earlier designations.

The *libyssa*-group differ strongly from the *Liptena* sensu stricto in the structure of the male genital armature ; in the true *Liptena* the uncus is crescent-shaped, attached all along its inner margin to the weakly sclerotized tegumen ; sometimes the subunci are nearly straight, more often curved dorsad, always completely separated from each other at their distal margins. In the *libyssa*-group the uncus is subtriangular, shield-shaped and only attached to the tegumen at either side and in the centre by a weak ligament. The strongly sclerotized subunci, much elaborated, are fused together along their inner margins. The aedeagus is very long, subcylindrical, sometimes sinuate, sometimes strongly angled near the base, then nearly straight to the distal extremity. These characters are so constant in all the species within the homogeneous *libyssa*-group that we have no hesitation in erecting for it a new genus which we name *Falcuna*. The fused subunci constitute a character unique in the Lycaenidae, so far as is known to the authors.

In *Falcuna* the origins of veins 3 and 4 of the hindwings are slightly separated ; in *undularis* they are shortly stalked. However, this does not constitute a true generic character for, in some *Liptena* sensu stricto, e.g. *fatima* Kirby and *submacula* Lathy, the origins of 3 and 4 are also slightly separated.

A remarkable conglomeration of genitalic forms came to light when the British Museum series of " *hollandii* " Aurivillius was examined ; no fewer than five forms were covered by the common label. The true identity of the species might never have been established but for the kind co-operation of Dr. H. J. Hannemann of the

Zoologisches Museum der Humboldt Universität, Berlin, who arranged the loan of three of the original series of *hollandii* collected by Dr. Pogge at Mukenge. From these, all labelled " Typus ", a Lectotype has been selected.

On hearing of the confusion prevailing in the British Museum series Monsieur L. A. Berger arranged to have all the Tervuren examples of " *hollandii* ", some thirty in all, sent to us for examination ; a similar medley of forms was discovered by dissection. For the loan of these specimens and also of the type of *Liptena synesia* Hulstaert our thanks are due to the authorities of the Musée Royal de L'Afrique Centrale, Tervuren, and especially to M. Berger for arranging the matter.

Our thanks are also due to Mr. Harry K. Clench, of the Carnegie Museum, Pittsburgh, Pennsylvania, U.S.A., for information concerning the type of *Liptena melandeta* Holland, a species not represented in the British Museum. The type has lost its abdomen and the only other example at Pittsburgh is a female, so it is not possible to give an accurate diagnosis of this species.

The following abbreviations are used in this paper : B.M. (N.H.) for British Museum (Natural History), Mus. Af. Cent. for Musée Royal de l'Afrique Centrale, Tervuren, and Zool. Mus. Berlin for Zoologisches Museum der Humboldt-Universität, Berlin.

FALCUNA gen. n.

Type species : *Liptena libyssa* Hewitson (1866).

Eyes bare ; *palpi* fairly long, projecting forward, clothed with adpressed scales, the second joint swollen, laterally compressed, the third joint slender and bluntly pointed ; *antennae* short, ringed with whitish scales at the joints and with a distinct subcylindrical club, bare at the apex ; *legs* with yellow annular markings.

Wing shape. Forewings : costa evenly arched, apex rounded, outer margin strongly convex. *Hindwings :* rounded, the anal angle not strongly marked.

Male genitalia : uncus a cupped, triangular lobe with a weakly depressed, pointed apex, appearing to be attached to the distal margin of the tegumen only at either side and at the centre ; *subunci* elaborated into two serrate-edged clubs which are fused together along their inner margins, the suture plainly visible under high magnification ; *tegumen* broad ; *anellus* a simple sheath ; *aedeagus* sinuate, tapering gradually from base to apex ; *valva* oblong, apex curving towards the dorsum and bearing a small, weakly sclerotized finger-like process near the dorsal margin, upper dorsal angle sometimes produced into a triangular lobe.

DESCRIPTION OF SPEECIS

Falcuna leonensis sp. n.

(Text-figs. 1–3 ; Pl. 1, figs. 56–59)

Types in B.M. (N.H.).

♂ *Facies :* Do not differ significantly from those of *libyssa libyssa* Hewitson.

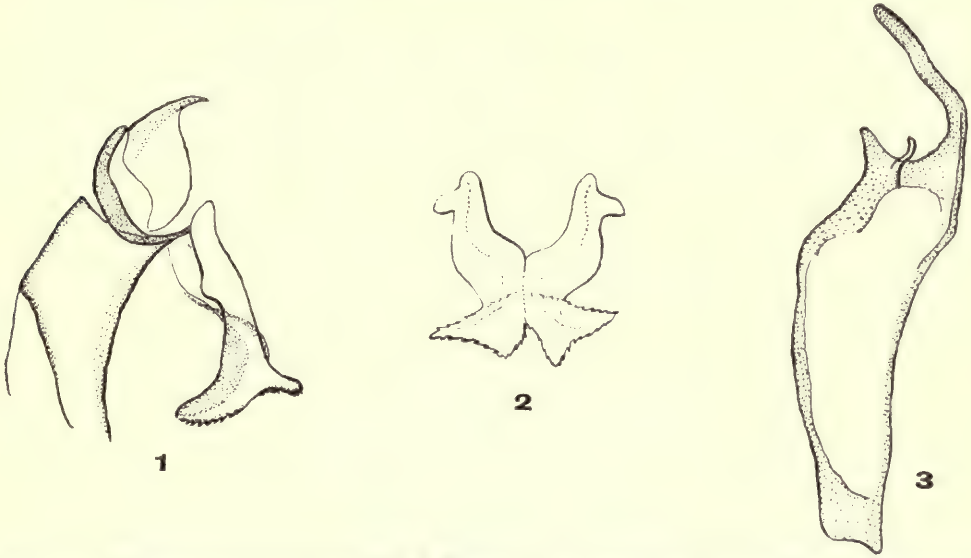
Genitalia : Subunci more finely serrate than those of typical *libyssa*, with a rounded lobe projecting from the outer angle of each half of the fused organs ; a small triangular lobe arises from the upper dorsal angle of the valva.

♀ *Facies :* Similar to those of the male, the only marked difference being the narrower dark costal margin of the upperside forewing.

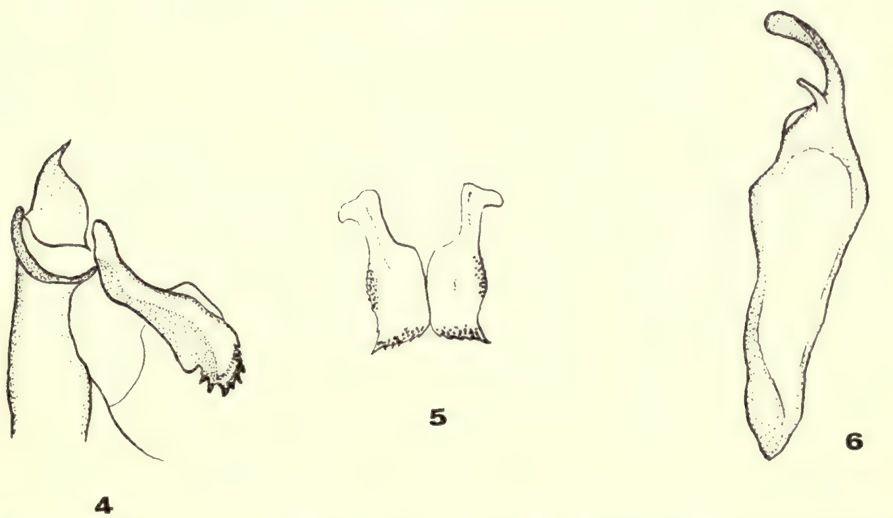
Holotype ♂ : SIERRA LEONE, Moyamba, 9.i.1902. B.M. Type No. Rh. 16500.

Allotype ♀ : SIERRA LEONE. B.M. Type No. Rh. 16501.

Paratypes : GUINEA REPUBLIC, Macenta, 2000 ft., v.1926, 1 ♂ (C. L. Collenette) ; SIERRA LEONE, Moyamba, 2 ♂ ; LIBERIA, Kpaine, 2 ♂, Sopia, 2 ♂ (Dr. W. Peters) ; IVORY COAST, 1919, 2 ♂ (Cremer) ; Morisano, 15.ii.1903, 1 ♂ (Pemberton) ; GHANA, Addah, 1 ♂ (M. Burtt) ; Kumasi, 1 ♂ (J. D. G. Sanders).



FIGS. 1–3. *Falcuna leonensis* Stempffer & Bennett : (1) uncus, etc., in profile, (2) subuncus in ventral view, (3) valva.



FIGS. 4–6. *Falcuna libyssa libyssa* Hewitson : (4) uncus, etc., in profile, (5) subuncus in ventral view, (6) valva.

Falcuna libyssa libyssa (Hewitson) **comb. n.**

(Text-figs. 4–6 ; Pl. 1, figs. 60–63)

Liptena libyssa Hewitson (1866 : 120, pl. 60, figs. 5, 6).

Types in B.M. (N.H.), neallotype ♀ here designated.

♂ *Facies :* Upperside fore and hind wings creamy-white ground colour, heavily margined with fuscous brown. Underside forewing ground colour creamy white, with two pale yellow spots in the apex ; hindwing ground colour pale yellow, patterned fuscous brown. (See Pl. 1, fig. 61).

Genitalia : Subunci coarsely serrate, without the projecting lobes which distinguish the preceding subspecies *leonensis*. Valva with a weak rounded lobe at the upper dorsal angle.

♀ *Facies :* Neallotype female with narrower fuscous margins on the upperside than in the male ; on the underside forewing the two apical spots are much larger than in the male ; hindwing ground colour and pattern as in the male.

Holotype ♂ : S. Nigeria, Calabar (Hewitson coll.). B.M. Type No. Rh. 16502.
Neallotype ♀ : S. Nigeria, Old Calabar, 86–126. B.M. Type No. Rh. 16503.
Distribution : S. Nigeria, N. Nigeria.

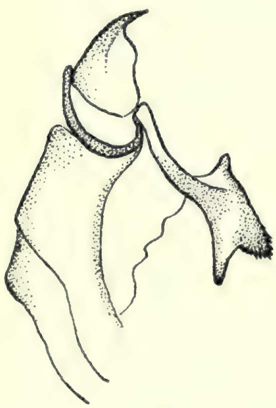
Falcuna libyssa cameroonica **ssp. n.**

(Text-figs. 7–9 ; Pl. 1, figs. 64–67)

Types in B.M. (N.H.).

♂ *Facies :* The apical area of the upperside forewing is rather broader than in typical *libyssa* ; this appears to be the only difference in the upperside pattern. There is no marked difference in the underside pattern.

Genitalia : Subunci readily distinguishable from those of *libyssa libyssa*, bearing two weak lobes upon the outer surface, a serrated bulge upon the ventral margin and two strongly developed



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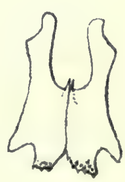

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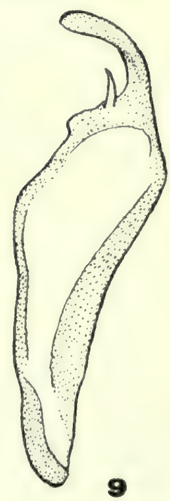

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Figs. 7–9. *Falcuna libyssa cameroonica* Stempffer & Bennett : (7) uncus, etc., in profile, (8) subuncus in ventral view, (9) valva.

points directed inwards ; valva with a stout apex curved dorsad and with a well-marked lobe on the dorsal margin.

♀ *Facies :* In the female selected as allotype the forewing length is about two and a half millimetres greater than that of the holotype ; the fuscous costal margin is much narrower, as is the hindwing margin, thus there is a great deal more white ground colour on the upperside. The underside forewing has also a greater expanse of white, while the yellow hindwing underside is less heavily marked than in the male.

Holotype ♂ : CAMEROONS, Johann Albrechts Hohe Station, 1898 (*L. Conradt*). B.M. Type No. Rh. 16504.

Allotype ♀ : CAMEROONS, Johann Albrechts Hohe Station, 1896 (*L. Conradt*). B.M. Type No. Rh. 16505.

Paratypes : CAMEROONS, Johann Albrechts Hohe Station, 1898, 3 ♂ (*L. Conradt*).

Distribution : CAMEROONS.

Falcuna libyssa angolensis ssp. n.

(Text-figs. 10–11 ; Pl. 1, figs. 68–71)

Types in B.M. (N.H.).

♂ *Facies :* Slightly smaller than typical *libyssa* ; upperside very similar ; underside less heavily marked.

Genitalia : Lobes of the subunci more finely serrate than in *libyssa*, with two small triangular points projecting from the dorsal surface near the line of fusion ; valvae as in *libyssa*.

♀ *Facies :* Hardly separable from typical *libyssa* on either surface.

Holotype ♂ : ANGOLA, prior to 1875 (*Monteiro*). B.M. Type No. Rh. 16506.

Allotype ♀ : ANGOLA (*Rogers*). B.M. Type No. Rh. 16507.

Paratypes : ANGOLA, 2 ♂, ex coll. Grose Smith.

Distribution : ANGOLA.

FIGS. 10–11. *Falcuna libyssa angolensis* Stempffer & Bennett : (10) uncus, etc., in profile, (11) valva.

Falcuna synesia synesia (Hulstaert) **comb. n.**

(Text-figs. 12–13; Pl. 1, figs. 72–73, Pl. 2, figs. 74–75)

Liptena synesia Hulstaert (1924 : 118).

Type in Mus. Af. Cent.

♂ *Genitalia :* The armature only varies from that of *synesia gabonensis* in small details ; in the ventral view of the fused subunci, wherein the terminal projections are considerably shorter and more outwardly directed from the central line, and in the apex of the valva, more slender and much less falcate than in *gabonensis*.

♀ *Facies :* Upperside forewing with slightly narrower fuscous margins than the male, the costal margin interrupted by a break-through of the discal white area midway between base and apex ; upperside hindwing as in the male, as is the underside pattern of both fore and hindwing.

Holotype ♂ : Mayumbe (*R. Verschueren*). Mus. Af. Cent.

Topotypes : Mayumbe, Bangebange, 1938, 1 ♂, 1 ♀, (*Mme. Menteau*). Mus. Af. Cent. Mayumbe, Luali, vi.1936, 1 ♂ (*F. G. Overlaet*). Mus. Af. Cent.

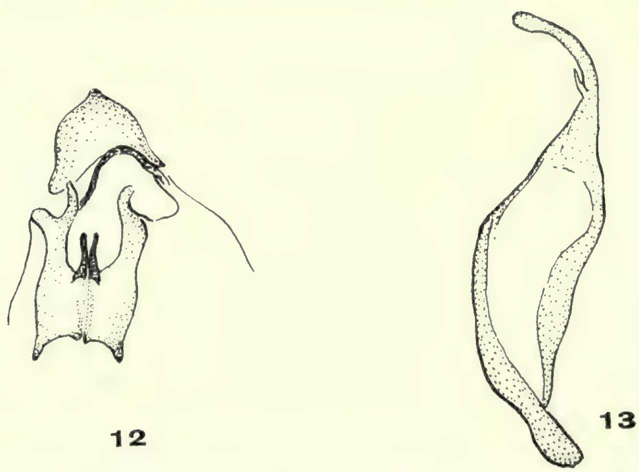
A small series of four males, three in the B.M. (N.H.) and one in the senior author's collection, are differentiated from *synesia synesia* by a darker underside with smaller white areas. As there appears to be no difference in the genitalia this is regarded as a **form n.** and is named *synesia landana*. The three B.M. specimens are from Landana, Cabinda. The male in the Stempffer collection is from Luali, Mayumbe (*F. G.Overlaet*).

Falcuna synesia gabonensis **ssp. n.**

(Text-figs. 14–16; Pl. 2, figs. 76–79)

Types in B.M. (N.H.).

♂ *Facies :* Smaller than *libyssa libyssa* ; upperside forewing more heavily margined, with inner edges of fuscous bands diffuse, white ground colour reduced to about one-third of the surface area ; hindwing underside yellow with a clear fuscous pattern.



FIGS. 12–13. *Falcuna synesia* Hulstaert : (12) subuncus, etc., in ventral view, (13) valva.

Genitalia : Subuncus differs sharply from that of the nominate subspecies inasmuch as the two sharp inward pointing angles at the ventral extremity are at least twice as long ; the apex of the valva more strongly falcate.

♀ *Facies :* Forewing approximately two millimetres longer than in the male, costal margin greatly reduced in width ; upperside forewing as in the male, hindwing with broader marginal markings.

Holotype ♂ : GABON, Abanga R., x. 1907 (*Dr. Ansorge*). B.M. Type No. Rh. 16508.

Allotype ♀ : data as Holotype. B.M. Type No. Rh. 16509.

Paratypes : RIO MUNI, Balengue, vi. 1919, 1 ♂ (*F. Escalera*). FERNANDO PO, vii. 1919, 1 ♂ (*F. Escalera*).

Distribution : CONGO REPUBLIC (ex French), GABOON, RIO MUNI, FERNANDO PO.

***Falcuna synesia fusca* ssp. n.**

(Text-figs. 17–19 ; Pl. 2, figs. 80–81)

Type in B.M. (N.H.).

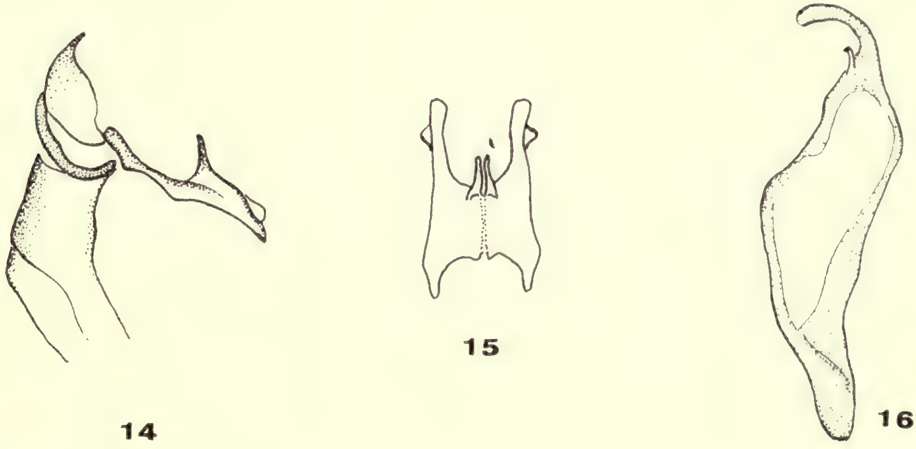
♂ *Facies :* Upperside forewing with only a small white area ; the inner edge of the fuscous margin poorly defined ; upperside hindwing as in *gabonensis*, as is the underside forewing ; the underside hindwing is so heavily margined that less than one-third of its area is of the dingy white ground colour. The holotype is rather more heavily margined than the paratypes.

Genitalia : The subuncus in profile resembles that of *gabonensis* except at the distal end, where there are rounded lobes instead of triangular points ; valvae as in *gabonensis*.

♀. Not known.

Holotype ♂ : CAMEROONS REPUBLIC (ex French), Bitje, 3° N., 12° E., Wet Season, 1926 (*G. L. Bates*). B.M. Type No. Rh. 16510.

Paratypes : CAMEROONS, Bitje, Dry Season, 1913, 1 ♂ ; Oubangui Chari, Bangassou, 1 ♂ ; both in B.M. (N.H.). Bangassou, 1 ♂ ; Mt. Cameroun, 1 ♂ ; both in coll. Stempffer.



FIGS. 14–16. *Falcuna synesia gabonensis* Stempffer & Bennett : (14) uncus, etc., in profile, (15) subuncus in ventral view, (16) valva.

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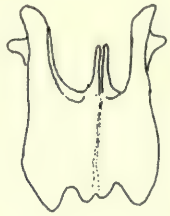

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FIGS. 17–19. *Falcuna synesia fusca* Stempffer & Bennett : (17) uncus, etc., in profile, (18) subuncus in ventral view, (19) valva.

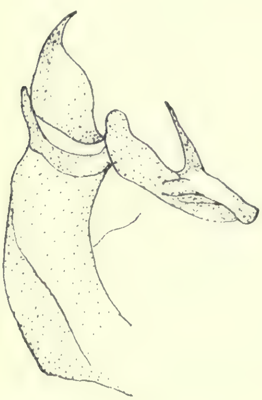
Falcuna lacteata sp. n.

(Text-figs. 20–22 ; Pl. 2, figs. 82–83)

Types in B.M. (N.H.).

♂ *Facies :* Upperside like that of *synesia landana* ; underside forewing also agrees ; underside hindwing with a creamy-white ground colour more boldly patterned than in *landana*.

Genitalia : Although the form of the subuncus reveals the affinity of this species to the *synesia*-complex, it differs in its relative shortness, while the dorsally directed prongs are larger and more sharply pointed ; the apex of the valva also differs from those of the *synesia*-group in the disposition of the dorsal lobe.



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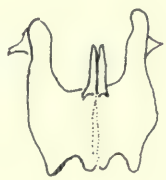

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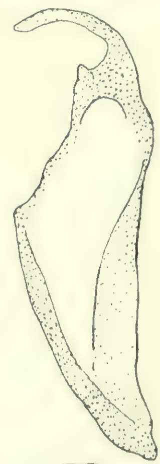

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FIGS. 20–22. *Falcuna lacteata* Stempffer & Bennett : (20) uncus, etc., in profile, (21) subuncus in ventral view, (22) valva.

♀ *Facies :* Forewing appreciably longer than in the male ; upperside shows a greater expanse of white ground colour, costal margin narrower ; underside forewing with fuscous outer margin tapering to a point at vein 1 ; underside hindwing more broadly and smoothly outlined than in the male.

Holotype ♂ : ANGOLA (Hewitson collection). B.M. Type No. Rh. 16511.
Allotype ♀ : ANGOLA (Godman-Salvin collection). B.M. Type No. Rh. 16512.
Paratype : ANGOLA, 1 ♂ (Hewitson collection).

Falcuna margarita (Suffert) **comb. n.**

(Text-figs. 23–25 ; Pl. 2, figs. 86–89)

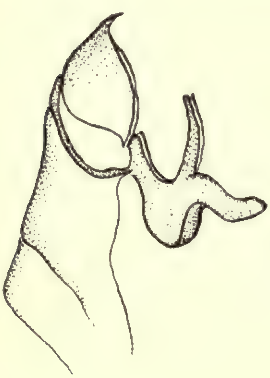
Liptena margarita Suffert (1904 : 51).
Liptena libyssa var. *latemarginata* Schultze (1916 : 38) **syn. n.**

Holotype ♂ in Zool. Mus. Berlin. (Figured by H. H. Druce in 1910 in Illustr. Afr. Lyc., pl. 3, figs. 1, 1*a*.)
Neallotype ♀ (here designated) in B.M. (N.H.).

♂ *Facies :* A point not noted in the original description is that the termination of the antennal club is bright yellow.

Genitalia : Subunci less broad than in *kasai*, with a strong pair of arms, curved dorsad, upon the outer surface ; a broad rounded bulge upon the inner margin ; apex of valva less stout than in *kasai*, falcate, with a finger-like process near the dorsal margin, which has a pronounced angle midway between base and apex.

♀ *Facies :* Forewing about two millimetres longer than in the male, costal margin narrower, less fuscous basal suffusion and so the area of whitish ground colour is more extensive upon the upperside ; hindwing upperside also displays a greater amount of white as there is no fuscous suffusion on the inner margin. Underside forewing has whitish ground colour tinged with pale yellow towards the costal margin ; costal, apical and outer margins fuscous, two large yellow spots in the apex, a faint broken yellow submarginal line near the outer margin, somewhat



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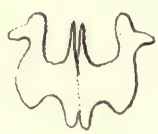

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FIGS. 23–25. *Falcuna margarita* Hewitson : (23) uncus, etc., in profile, (24) subuncus in ventral view, (25) valva.

dilated in spaces 2 and 3 ; underside hindwing more lightly patterned than in the male. Fringes of forewing fuscous, interrupted with whitish scales ; of hindwing yellowish buff.

Holotype ♂ : CAMEROON, Lolodorf (*von Conradt*).
Neallotype ♀ : CAMEROONS, Bitje, Ja Riv., 2000 ft., ix–xi.1932. B.M. Type No. Rh. 16513.
Distribution : CAMEROONS (ex French) ; GABOON ; CONGO REPUBLIC (ex Belgian), Ituri, Katanga.

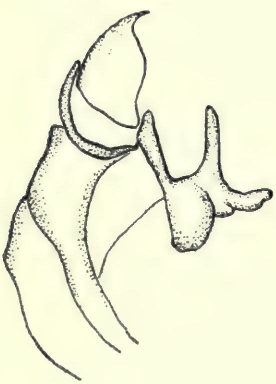
Falcuna kasai sp. n.

(Text-figs. 26–28 ; Pl. 2, figs. 90–91 ; Pl. 3, figs. 92–93)

Types in B.M. (N.H.).

♂ *Facies :* Smaller than *margarita* ; both fore and hindwing uppersides less heavily margined and ground colour purer white ; underside forewing with more sharply defined margins, hindwing with fuscous pattern less broken than *margarita*.
Genitalia : Subuncus deeper and shorter in profile than that of *margarita*, with wider and longer ventral terminations, distal extremity of valva much stouter and more falcate, with a blunt triangular lobe on the dorsal margin near the apex.
♀ *Facies :* Upperside fore and hindwings with narrower margins than *margarita* ; outer margin of forewing more convex ; underside forewing similar to *margarita* ; hindwing with fuscous pattern less broken.

Holotype ♂ : Kasai Riv., Luebo (*P. Landbeck*), B.M. Type No. Rh. 16514.
Allotype ♂ : data as Holotype. B.M. Type No. Rh. 16515.
Paratypes : Kasai Dist. (ex Belg.) Luluabourg, a series, 20 ♂, 5 ♀ (*R. H.Carcasson*) in Coryndon Museum, Nairobi.
Distribution : CONGO F. S., Kasai Dist.



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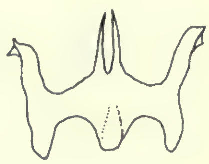

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FIGS. 26–28. *Falcuna kasai* Stempffer & Bennett : (26) uncus, etc., in profile, (27) subuncus in ventral view, (28) valva.

Falcuna orientalis (Bethune-Baker) **comb. n.**

(Text-figs. 29–31; Pl. 3, figs. 94–97)

Liptena libyssa orientalis Bethune-Baker (1906 : 339).
Liptena libyssa confluens Grünberg (1908 : 50) (**syn. n.**).

Holotype ♂, Neallotype ♀ (here designated), in B.M. (N.H.).

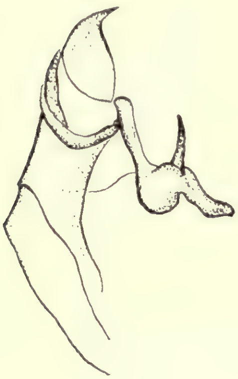
♂ *Genitalia :* In profile the subuncus is reminiscent of those of *margarita* and *kasai*, but from the ventral aspect there is a marked difference ; the finger-like process on the dorsal margin of the valva is also relatively larger, curving in the same plane as the apex.

♀ *Facies :* Neallotype female a little larger than the male, upperside margins slightly narrower, thereby displaying a greater area of white ground colour ; underside pattern closely resembles that of the male.

Holotype ♂ : UGANDA, Mengo, iii.1900 (*Jackson* leg.). B.M. Type No. Rh. 16516.

Neallotype ♀ : UGANDA, Entebbe, ix.1900 (*Capt. H. B. Rattray*). B.M. Type No. Rh. 16517.

Distribution : UGANDA, Entebbe ; Kampala ; Mabira F. ; Mulanje : Bugoma F. ; Budongo F.; Bajo ; Daro F.; Munyonyo, Unyoro ; B.E.A., Yala R.; Kibwezi ; Slopes of Mt. Elgon.



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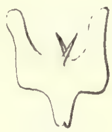

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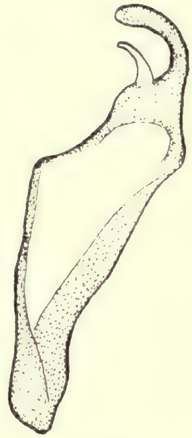

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FIGS. 29–31. *Falcuna orientalis* Bethune-Baker : (29) uncus, etc., in profile, (30) subuncus in ventral view, (31) valva.

Falcuna orientalis bwamba **ssp. n.**

(Text-figs. 32–34 ; Pl. 3, figs. 98–101)

Types in B.M. (N.H.).

♂ *Facies :* Upperside fore and hindwings almost identical with those of *orientalis*. The underside forewing is also alike, but the underside hindwing is conspicuously different, the fuscous pattern on the pale yellow ground is reduced in area to a greater degree than in any other form within the genus ; it most closely resembles the pattern of *libyssa angolensis*.

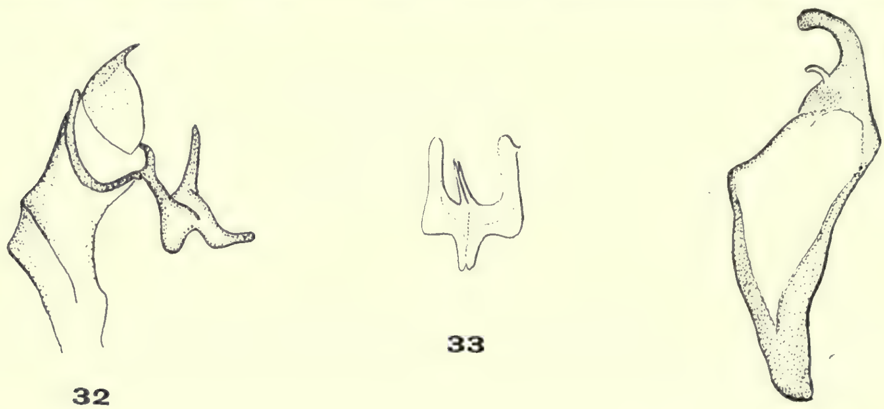
Genitalia : The reason for giving this form no more than subspecific rank lies in the fact that the armature only differs in minor degree from that of *orientalis*. In profile the bulge on the underside of the subuncus is narrower in *bwamba* and the ventral lobe on the apex of the valva is much reduced.

♀ *Facies :* Upperside fore and hindwing as in *orientalis*, underside forewing also ; underside hindwing strongly differing as in the male, the fuscous pattern slightly heavier than in the opposite sex.

Holotype ♂ : UGANDA, Bwamba, viii.1942 (*T. H. E. Jackson*). B.M. Type No. Rh. 16518.

Allotype ♀ : UGANDA, Bwamba, x.1942 (*T. H. E. Jackson*). B.M. Type No. Rh. 16519.

Distribution : UGANDA, Bwamba ; Itoa R., Ituri For. ; Upper Maico Val. ; W. Semliki Val.; Rutshuru R., N. Kivu ; Mulanje, Maniema Distr., CONGO (ex Belg.).



32 33 34

FIGS. 32–34. *Falcuna orientalis bwamba* Stempffer & Bennett : (32) uncus, etc., in profile, (33) subuncus in ventral view, (34) valva.

Falcuna hollandii suffusa **ssp. n.**

(Text-figs. 35–37 ; Pl. 3, figs. 102–105)

Types in B.M. (N.H.).

♂ *Facies :* A fairly small subspecies, with wide fuscous margins on the upperside of both fore and hindwings, the inner edges of the margins diffuse and ill-defined in comparison with the clear-cut edges in *hollandii*. The whitish central area is reduced to less than one-third of the forewing, a little more on the hindwing. Underside forewing with a dark costal margin and apical triangle, the outer margin tapering from the apex to a point at vein 2, a clear white hind margin ; underside hindwing so heavily marked as to appear black, sparsely spotted with creamy white.

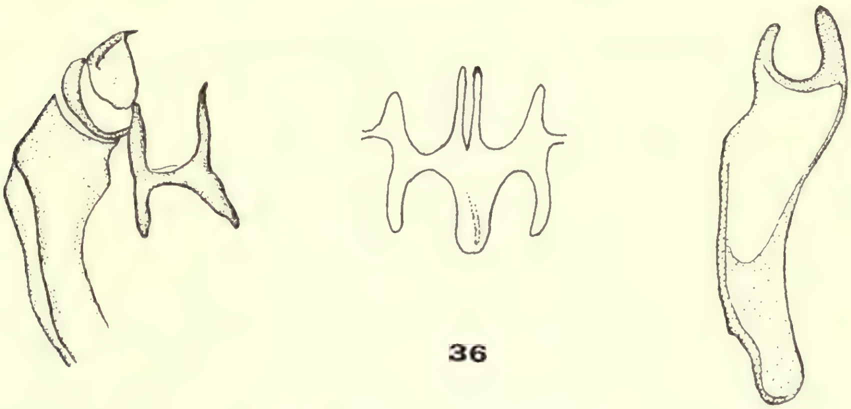
Genitalia : In *hollandii* and its subspecies the subuncal lobes are developed to a greater degree than in any other form in the genus ; two stout arms descend from the inner surface and a pair of strong tapering arms ascend from the outer surface near the point of fusion, while the free end of the fused lobes is drawn out in a long blunt point. Valva with a moderately long, almost straight ventral apex, the upper dorsal margin is produced into a tapering lobe, curved towards the apex and about three quarters as long.

♀ *Facies :* Forewing about two millimetres longer than in the male ; fuscous margins narrower and more clearly defined upon their inner edges, white ground colour more extensive. Hindwing upperside as in the male. Underside of both wings as in the male.

Holotype ♂ : S. CAMEROONS, Bitje, Ja Riv., iv–vi. 1919 (Lesser rains) (*G. L. Bates*). B.M. Type No. Rh. 16520.

Allotype ♀ : same data as holotype. B.M. Type No. Rh. 16521.

Paratypes : CAMEROONS, Bitje, 10 ♂, 8 ♀ ; SPAN. GUINEA, 1 ♂, all in B.M. (N.H.).



35 36 37

FIGS. 35–37. *Falcuna hollandii suffusa* Stempffer & Bennett : (35) uncus, etc., in profile, (36) subuncus in ventral view, (37) valva.

Falcuna hollandii hollandii (Aurivillius) **comb. n.**

(Text-fig. 38 ; Pl. 3, figs. 106–107)

Liptena Hollandii Aurivillius (1895 : 200).

Lectotype in Zool. Mus. Berlin.

Three males of the original series collected by Dr. H. Pogge at Mukenge, from which the Dewitz figures in *D. ent. Zeitschr.* 1886, taf. 2, figs. 4 and 4*a* were derived, were made available for study by the courtesy of Dr. Hanneman, of the Zoologisches Museum der Humboldt Universität, Berlin. All three specimens are labelled " Typus " and the best of these has been selected as Lectotype.

It should here be pointed out that the Dewitz figure of the underside hindwing cannot be taken as a guide to determination as it distorts the placing of the triangular white spot on the costa, showing it too near the base of the wing.

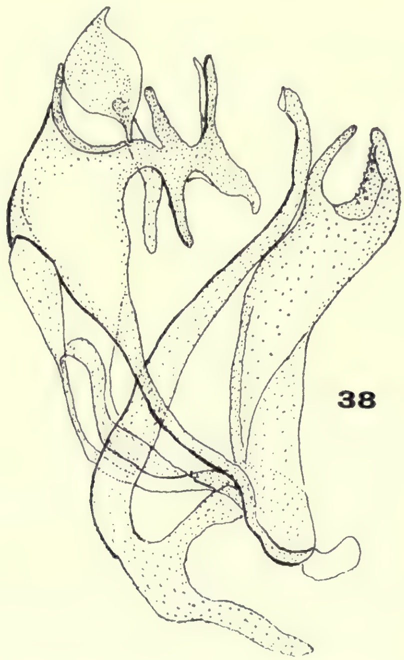
It is possible to see the genitalia of the Lectotype *in situ*, so there is no doubt as to its identity. With this and the other two Mukenge males as a basis for determination it has been possible to isolate four further examples of the species, all from Kasai Prov., from the mixture of B.M. (N.H.) material, as well as a male from the Coryndon Museum, Nairobi.

♂ *Facies :* Rather larger than *suffusa*, with darker fuscous margins ; white spots of hindwing underside more extensive.

Genitalia : As described and figured for *suffusa*.

♀ Not known.

Lectotype ♂ : Mukenge (*Dr. Pogge*). Zool. Mus. Berlin. Also in Berlin, 2 ♂, same data ; CONGO F. S., Upper Kasai, 2 ♂ (*F. Landbeck*), B.M. (N.H.) ; Kasai, Luebo, 1 ♂ (*F. Landbeck*), B.M. (N.H.) ; Kasai, Kapulumbo, 1 ♂ (*Landbeck*), B.M. (N.H.) ; Kasai, Mwene Ditu, iii.1959, 1 ♂ (*R. H. Carcasson*), Coryndon Museum, Nairobi.



38

FIG. 38. *Falcuna hollandii hollandii* Aurivillius : (38) armature in profile, one valva removed.

Falcuna hollandii nigricans ssp. n.

(Pl. 3, figs. 108–109 ; Pl. 4, figs. 110–111)

Types in Mus. Af. Cent.

♂ *Facies :* This subspecies appears to differ slightly from one locality to another, but in all cases is separable from *suffusa* and *hollandii* by appearing really black and white as compared with fuscuous brown and white. The male selected as holotype, from Sankuru, Katako Kombe, has the white area of the upperside forewing restricted to a small, almost circular patch based midway along the hind margin. The hindwing white area is also quite small. Except in coloration the underside does not differ significantly from the other subspecies.

Genitalia : As described for the subspecies *suffusa*.

♀ *Facies :* Upperside forewing with costal black band linear, the large central area pure white and sharply defined. Hindwing upperside also with a pure white central area, with the bold underside pattern showing through. Underside forewing with a narrow, parallel-sided costal band

from base to midway along the margin, where it is interrupted by the central white area. Underside hindwing patterned with large spots of pure white on a black background.

Holotype ♂ : Sankuru, Katako Kombe, 24.iii.53 (*Dr. Fontaine*). Mus. Af. Cent.

Allotype ♀ : Sankuru, Katako Kombe, 24.iv.53 (*Dr. Fontaine*). Mus. Af. Cent.

Paratypes : Sankuru, Katako Kombe, 30.vii.52, 1 ♂ (*Dr. Fontaine*) ; Sankuru, Kohindi, 15.xii.52, 1 ♂ (*Dr. Fontaine*) ; Sankuru, 17.iii.53, 1 ♂ (*Dr. Fontaine*).

Other material : CONGO (ex Belg.) Uele, Paulis, various dates, 2 ♂, 4 ♀ (*Dr. M. Fontaine*) ; Equateur, Eala, viii.1933, 1 ♂ (*Mme. J. Ghesquière*) ; Katanga, Kalenje, Kapanga, xii.1933, 1 ♂ (*F. G. Overlaet*) ; Sankuru, Mbangobango, 23.xi.49, 1 ♂ (*Dr. M. Fontaine*) ; Tshuape, Bokote, 1927, 1 ♂ (*R. P. Hulstaert*) ; Uele, Zobia-Niapu-Poko, ix.1911, 1 ♂ (*Mme. Hutereau*), all in Mus. Af. Cent. CONGO (ex Fr.) Etoumbi, xii.1960, 1 ♂ (*T. H. E. Jackson*), Stempffer coll., Paris.

Falcuna iturina **sp. n.**

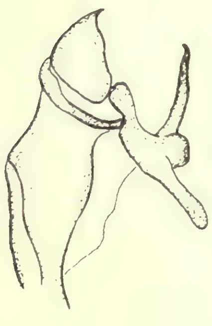
(Text-figs. 39–41 ; Pl. 4, figs. 112–115)

Holotype ♂ in B.M. (N.H.).

Allotype ♀ in B.M. (N.H.) (T. H. E. Jackson collection).

♂ *Facies :* Differs from *hollandii* in having rather larger areas of white ground colour on upperside fore and hindwing, with narrower fuscous margins ; the hind margin of upperside hindwing is not bordered fuscous. Underside white areas of both wings larger and brighter than in *hollandii*.

Genitalia : Subuncus bearing upon the outer surface a pair of strong arms, slightly hooked at the tips, arising from rounded bulges ; free ends of the subuncal lobes narrow, rounded ; there is no interruption of the smooth profile of the inner surface. Valva with a blunt ventral apex, furnished on its dorsal margin with short spines ; from the upper dorsal margin arises a smooth lobe about half as long as the apex.



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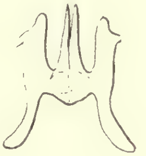

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FIGS. 39–41. *Falcuna iturina* Stempffer & Bennett ; (39) uncus, etc., in profile, (40) subuncus in ventral view, (41) valva.

♀ *Facies :* Very similar in appearance to the male, but forewing length about two millimetres greater. Spots of underside hindwing rather more creamy-white than in the male.

Holotype ♂ : E. CONGO, Osa-Lowa Watershed, viii.1921 (*T. A. Barns*). B.M. Type No. Rh. 16522.

Allotype ♀ : CONGO REP. (ex Belg.) Beni, Ituri, 4000 ft., April 1947 (*T. H. E. Jackson*).

Paratypes : CONGO REP. (ex Belg.) Ituri F., i.1920, 3 ♂ (*T. A. Barns*) ; Cartouche nr. Lesse, W. Semliki R., i.1920, 1 ♂ (*T. A. Barns*) ; UGANDA, Bwamba, iv–xii.1942, 1 ♂ (*T. H. E. Jackson*).

Falcuna semliki sp. n.

(Text-figs. 42–43 ; Pl. 4, figs. 116–117)

Type in B.M. (N.H.).

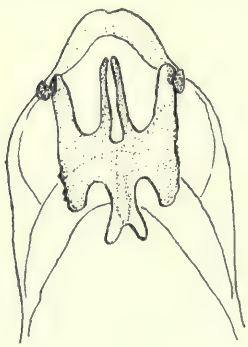
♂ *Facies :* Upperside fore and hindwings having moderately wide fuscous margins, with clearly defined inner edges. The ground colour, pure white, is less restricted than in the associated species *reducta*, to which *semliki* is allied by the pattern of the genitalia. Underside forewing with a narrow fuscous costal margin, no basal suffusion, a wide fuscous apical area tapering to a line on the outer margin ; underside hindwing heavily marked fuscous, only about one-third of the total expanse milky-white.

Genitalia : As the subuncus in profile displays no marked character it is figured here from the ventral aspect. Two long, tapering arms arise from the outer surface near the point of fusion. The outer ends of the subunci are, in this species and in *reducta*, welded together in the form of a " fishtail ", but in *semliki* this feature is considerably more produced than in *reducta*. The valva is long, with a slender apex inclined dorsad ; there is a small bulge on the upper dorsal margin.

♀. Not known.

Holotype ♂ : CONGO REP. (ex Belg.) West Semliki Val., Escarpment, 20 m. S.W. of Boga (*T. A. Barns*). B.M. Type No. Rh. 16523.

The specimen described above is unique.



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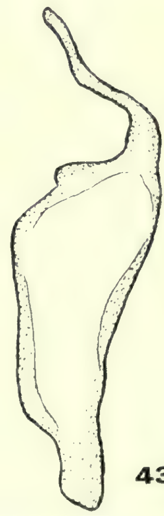

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FIGS. 42–43. *Falcuna semliki* Stempffer & Bennett : (42) subuncus, etc., in ventral view, (43) valva.

Falcuna reducta sp. n.

(Text-figs. 44–45 ; Pl. 4, figs. 118–121)

Holotype ♂ in B.M. (N.H.).
Allotype ♀ in Mus. Af. Cent.

♂ *Facies :* Upperside forewing dark fuscous, the white area reduced to a small, almost circular, poorly defined zone situated midway along the hind margin ; upperside hindwing with very wide fuscous margins, more clearly defined than in the forewing. Underside forewing with broad costal and apical margins, tapering to a point on the outer margin ; hindwing underside suffused to such an extent as to show no more than a few small creamy white spots.

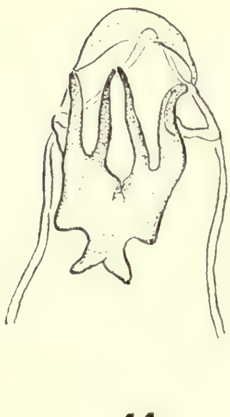
Genitalia : As in the preceding species the subuncus in profile displays no significant detail, so again it is figured from the ventral aspect. It closely resembles the armature of *semliki*, but the outer ends of the subuncal lobes are united in a shorter " fishtail ". The apex of the valva seems rather longer than in *semliki*.

♀ *Facies :* Upperside forewing with much larger and more clearly defined white central disc than in the male ; forewing length about the same ; upperside hindwing as in the male, as is the underside forewing ; underside hindwing with larger white spots, especially the one placed centrally on the wing.

Holotype ♂ : CAMEROONS, Bitje, Ja Riv., 2,000 ft. (*G. L. Bates*). B.M. Type No. Rh. 16524.

Allotype ♀ : CAMEROONS, Bitje (*Bates*). Mus. Af. Cent.

Paratypes : CAMEROONS, Bitje, 6 ♂ in B.M. (N.H.) ; CAMEROONS, Bitje, 1 ♂ in Mus. Af. Cent.



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FIGS. 44–45. *Falcuna reducta* Stempffer & Bennett : (44) subuncus, etc., in ventral view, (45) valva.

Falcuna dorotheae sp. n.

(Text-figs. 46–48; Pl. 4, figs. 122–123)

Type in B.M. (N.H.).

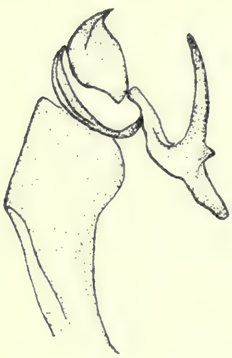
♂ *Facies:* Upperside forewing and hindwing broadly fuscous, inner margins not clearly defined; creamy white basal area on both wings; underside forewing with narrower fuscous margins than above, with two off-white spots in the apex and two more, smaller, on the outer margin; underside hindwing heavily marked with a fuscous pattern typical of the group.

Genitalia: Subuncal lobes bearing a very large pair of slightly curved and tapering arms upon their outer surface, no projections from their inner surface, terminal points bluntly rounded; valva with a broader and less falcate apex than in *overlaeti*, with a smoothly rounded tip, a small triangular lobe near the dorsal margin.

♀. Not known.

Holotype ♂: CAMEROONS, Bitje, Ja Riv., 2,000 ft., x–xi. 1912. B.M. Type No. Rh. 16525.

Paratypes: CAMEROONS, Bitje, 3 ♂; N.W. KIVU, Lowa Val., 3 days above Walikele, 4,300 ft., ix. 1921, 1 ♂ (*T. A. Barns*).



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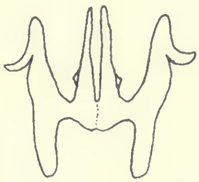

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FIGS. 46–48. *Falcuna dorotheae* Stempffer & Bennett: (46) uncus, etc., in profile, (47) subuncus in ventral view, (48) valva.

Falcuna overlaeti sp. n.

(Text-figs. 49–50; Pl. 4, figs. 124–125)

Type in Mus. Af. Cent.

♂ *Facies:* This is the smallest representative of the genus. The upperside forewing costal margin is narrow, the apical triangle extending from halfway along the costal margin and prolonged in a three-millimetres wide outer margin. Hindwing with a moderately wide fuscous margin. Underside forewing with a pure white, clearly defined central area which breaks through to the outer edge of the costal margin at about midway between base and apex. There is a pro-

minent wedge-shaped white spot in the apex and an ill-defined row of white patches along the outer margin. Underside hindwing with the usual basic pattern of the genus, the white patches fairly large.

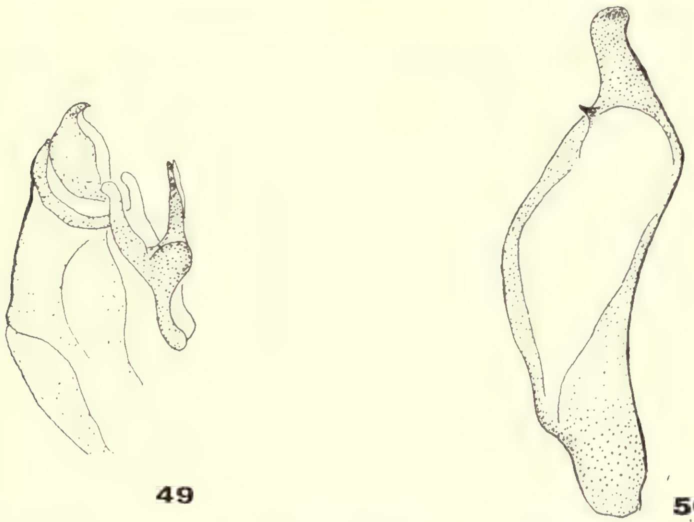
Genitalia : Subuncal lobes of similar pattern to those of *F. dorotheae* ; valvae also similar, but with narrower apices more sharply falcate than in that species.

♀. Not known.

Holotype ♂ : Congo (ex Belg.) Kapanga, Lulua (*F. G. Overlaet*).

The specimen described above is unique.

Named for the late F. G. Overlaet, the noted collector and taxonomist.



49 50

Figs. 49–50. *Falcuna overlaeti* Stempffer & Bennett : (49) uncus, etc., in profile, (50) valva.

Falcuna campimus campimus (Holland) **comb. n.**

(Text-figs. 51–52 ; Pl. 4, figs. 126–127 ; Pl. 5, figs. 128–129)

Larinopoda campimus Holland (1890 : 427).
Liptena campimus (Holland) Seitz (1918 : 331, pl. 63*g*, ♂).

Type not seen.

Neallotype ♀ (here designated) in B.M. (N.H.).

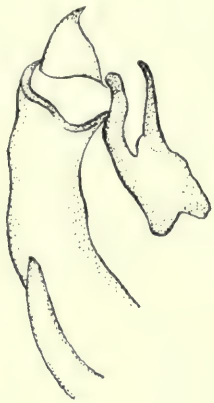
Genitalia : Distinct from any other in the genus in the strongly depressed apex of the valva and in the curved distal end of the aedeagus, which almost follows the outline of the valvae. Subuncus with two strong arms arising from near the suture on the outer surface, these extend parallel with the surface, directed dorsad. The outer ends of the subuncal lobes are much broadened and bluntly rounded ; there are no projections from the inner surface. Valva with a curved apex, fairly broad, a lobe arising from the upper dorsal margin about three-quarters as long as the apex.

♀ *Facies :* A little larger than the male, with narrower fuscous margins of the forewing upperside. The white areas of both fore and hindwing more extensive. Underside hardly differs from the male in either wing.

Holotype ♂: GABOON, Upper waters of R. Ogove (*Rev. A. C. Good*).

Neallotype ♀: S. NIGERIA, Akpabuyo, viii.1920 (*D. Cator*). B.M. Type No. Rh. 16526.

Distribution: GABOON, S. NIGERIA, IVORY COAST, LIBERIA, SIERRA LEONE, S. CAMEROONS, Mamfe, Victoria Kumba.



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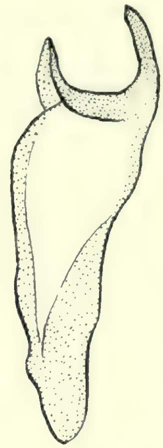

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FIGS. 51–52. *Falcuna campimus campimus* Holland: (51) uncus, etc., in profile, (52) valva.

Falcuna campimus dilatata (Schultze & Aurivillius) **comb. n.**

(Pl. 5, figs. 130–131)

Liptena campimus var. *dilatata* Schultze & Aurivillius (1923: 1177).

Neotype and neallotype (here designated) from the T. H. E. Jackson coll.

It should here be stated that the authors can reach no certain conclusions about the status of this form, although the recent acquisition of an authentic pair of specimens from Obudu, Ogoja Province, S. Nigeria throws some light upon the problem.

Schultze described his "*var. dilatata*" from specimens from "N.W. Kamerun", without any precise locality, comparing them with a unique female of "*campimus campimus*" from South Cameroons, Elefantenberg near Kribi. He cited as the most outstanding character of *dilatata* the very wide dark margins of the upperside of both fore and hindwings, the white area of the forewing strongly reduced. On the underside also the white patches are restricted. Schultze did not state the sex of his type so we do not know whether he compared both sexes with his unique female of *campimus*. We have been unable to examine any specimens from N.W. Cameroons.

In the B.M. (N.H.) collection there is a series of males from Ghana, Kumasi, all the individuals of which agree with the *dilatata* description, so that at first it would seem that this is a good subspecies. The question becomes more involved, however, when we consider the Nigerian material, which has been determined as follows:

Ahoada Prov., Eleala,	*c. campimus* ♀ ;	*c. dilatata* ♂	
Onitscha Prov., Mamu For., ,,	♀		
Ogoja Prov., Obubia, ,,	,, ♂, ♀ ;	,, ,,	♂
,, ,, Ikom, ,,	,, ♂, ♀ ;	,, ,,	♂
,, ,, Obudu,		,, ,,	♂, ♀

According to information received from T. H. E. Jackson, his native collector working the last-named locality took a few specimens of *dilatata* but no *c. campimus* among several hundreds of Lipteninae of various species.

The female of *campimus dilatata* differs from that of *c. campimus* in the following characters :

Upperside : The black margins of both wings are widened, but in the forewing not so much as in the male.

Underside : The central white patch of the hindwing is reduced, clear-cut and silvery-white in this form, slightly creamy-white in *C. campimus*.

As the Schultze types are lost we select as neotype and neallotype the pair collected in June, 1961, at Obudu, from the T. H. E. Jackson collection, now in the B.M. (N.H.).

Despite making dissections of all available males we can discover no reliable differences to separate the two forms.

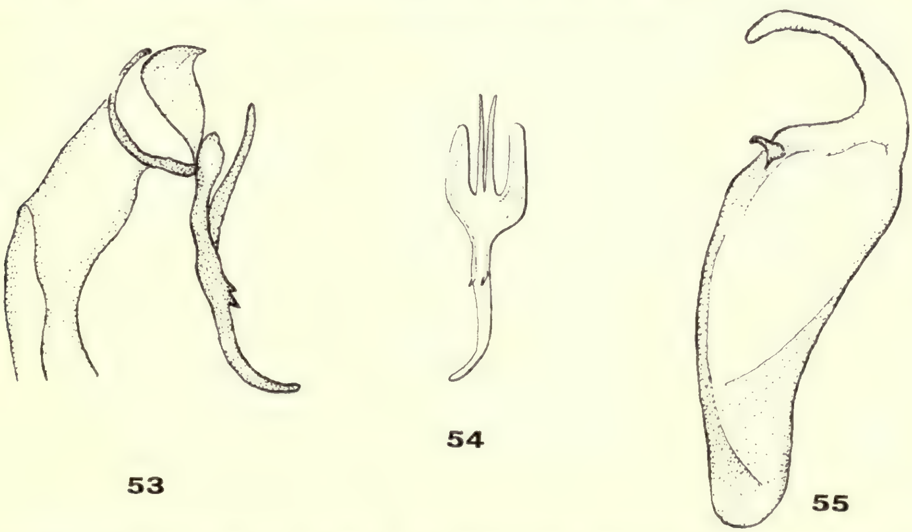
Distribution : N.W. CAMEROONS, NIGERIA, GOLD COAST.

Falcuna lybia (Staudinger) **comb. n.**

(Text-figs. 53–55 ; Pl. 5, figs. 132–135)

Larinopoda lybia Staudinger (1891 : 217).
Liptena lybia (Staudinger) Seitz (1918 : 331, pl. 63*g*, ♂).

Holotype ♂, Neallotype ♀ (here designated) in B.M. (N.H.).



53 54 55

FIGS. 53–55. *Falcuna lybia* Staudinger : (53) uncus, etc., in profile, (54) subuncus in ventral view, (55) valva.

Genitalia : Readily distinguishable from any other within the genus by the slender construction of the subuncal lobes, which are strongly excurved at the free end and without projections from the inner surface. The valvae also differ considerably, the apices curving almost in a semicircle, with a very small finger-like process on the dorsal margin a long way from the apex.

♀ *Facies :* Differ only slightly from those of the male, being a little larger and with a more extensive white area on the upperside forewing.

Holotype ♂ : GABOON (*Mocquerys*). B.M. Type No. Rh. 16527.

Neallotype ♀ : GABOON, ex Godman-Salvin collection. B.M. Type No. Rh. 16528.

Falcuna melandeta (Holland) **comb. n.**

Larinopoda melandeta Holland (1893 : 25).

Type in the Carnegie Museum, Pittsburgh, Pa., U.S.A.

For information concerning this species were are indebted to Mr. Harry K. Clench of the Carnegie Museum.

Unfortunately it is not possible to assign this species to any fixed place in the foregoing scheme as the type is without its abdomen and the only other example is a female. From the author's description of the facies, however, we may safely ascribe it to this genus.

Habitat : GABOON, Talaguga, Upper Valley of the Ogove.

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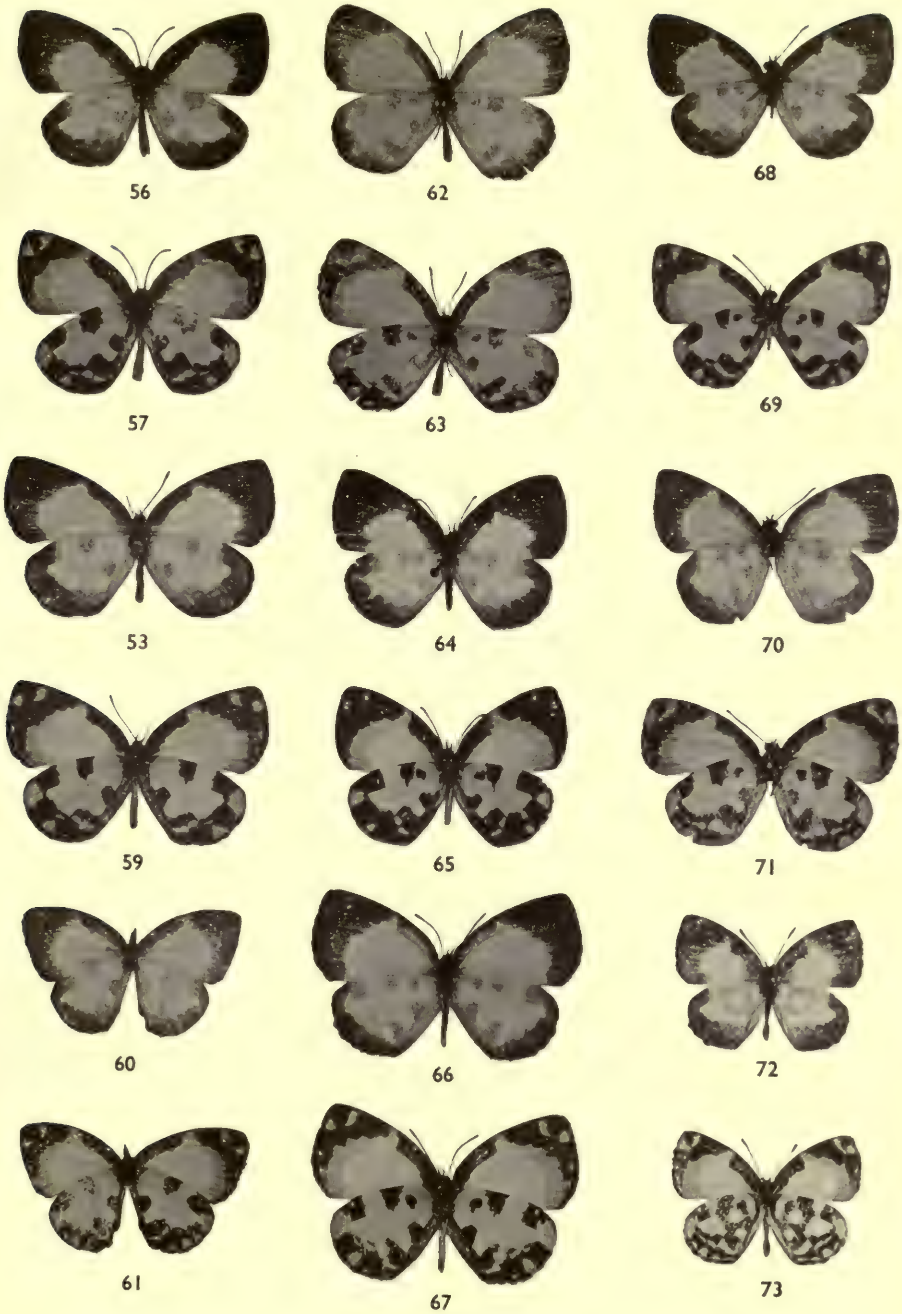
SUFFERT, E., 1904, Neue afrikanische Tagfalter. *Iris*, **17** : 12–107.

PLATE 1

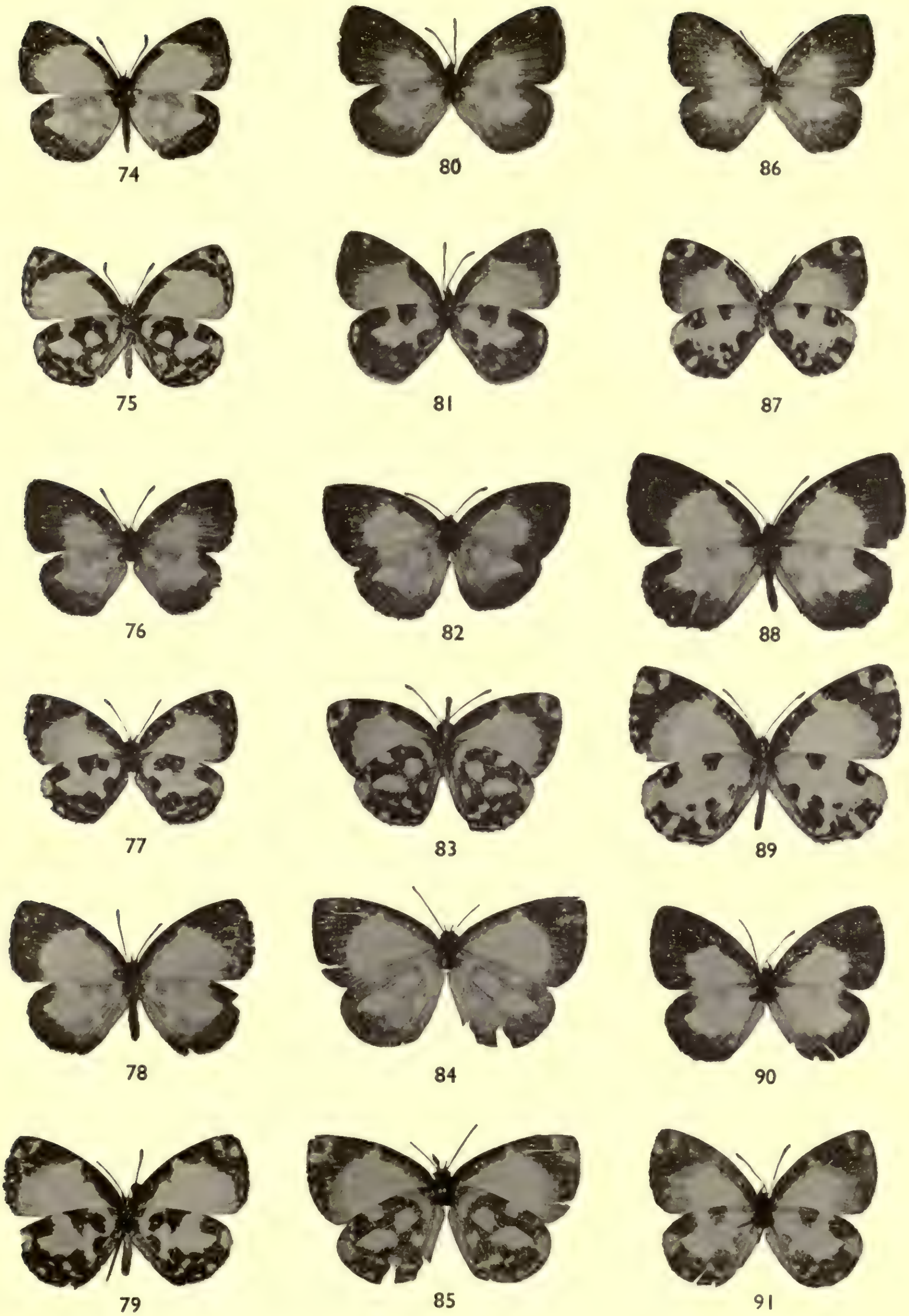
FIGS. 56–73. Uppersides and undersides, respectively, of *Falcuna :* (56, 57) *leonensis* Stempffer & Bennett, male (*B.M. Neg. Nos. 28204a, b*) ; (58, 59) female (*28205 b, a*) ; (60, 61) *libyssa libyssa* Hewitson, male (*28212a, b*) ; (62, 63) female (*28185a, b*) ; (64, 65) *libyssa cameroonica* Stempffer & Bennett, male (*28206b, a*) ; (66, 67) female (*28207a, b*) ; (68, 69) *libyssa angolensis* Stempffer & Bennett, male (*28208a, b*) ; (70, 71) female (*28209b, a*) ; (72, 73) *synesia synesia* Hulstaert, male (*28316, 28317*).



A New Liptenine Genus (Lep., Lyc.) Stempffer & Bennett

PLATE 2

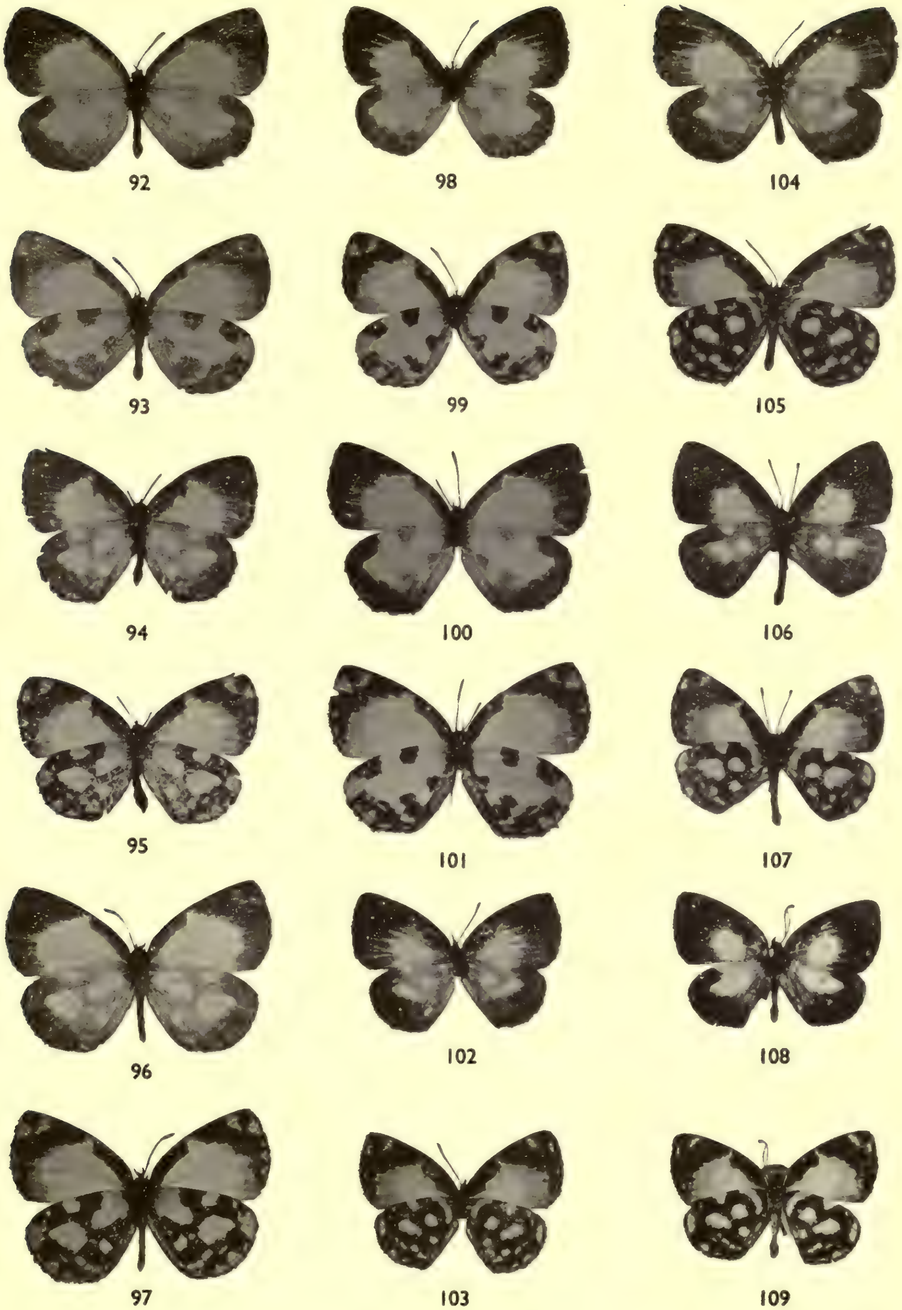
FIGS. 74–91. Uppersides and undersides, respectively, of *Falcuna*: (74, 75) *synesia synesia* Hulstaert, female (*30400, 30401*); (76, 77) *synesia gabonensis* Stempffer & Bennett, male (*28210a, b*); (78, 79) female (*28211a, b*); (80, 81) *synesia fusca* Stempffer & Bennett, male (*28197, 28198*); (82, 83) *lacteata* Stempffer & Bennett, male (*28199a, b*); (84, 85) female (*28213b, a*); (86, 87) *margarita* Hewitson, male (*28319, 28318*); (88, 89) female (*28200b, a*); (90, 91) *kasai* Stempffer & Bennett, male (*28201a, b*).



A New Liptenine Genus (Lep., Lyc.) Stempffer & Bennett

PLATE 3

FIGS. 92–109. Uppersides and undersides, respectively, of *Falcuna* : (92, 93) *kasai* Stempffer & Bennett, female (*28203a, b*) ; (94, 95) *orientalis orientalis* Bethune-Baker, male (*28184a, b*) ; (96, 97) female (*28204a, b*) ; (98, 99) *orientalis bwamba* Stempffer & Bennett, male (*28192a, b*) ; (100, 101) female (*28193a, b*) ; (102, 103) *hollandii suffusa* Stempffer & Bennett, male (*28195b, a*) ; (104, 105) female (*28196b, a*) ; (106, 107) *hollandii hollandii* Aurivillius, male (*28194b, a*) ; (108, 109) *hollandii nigricans* Stempffer & Bennett, male (*30398, 30399*).



A New Liptenine Genus (Lep., Lyc.) Stempffer & Bennett

PLATE 4

FIGS. 110–127. Uppersides and undersides, respectively, of *Falcuna*: (110, 111) *hollandii nigricans* Stempffer & Bennett, female (*30390, 30391*); (112, 113) *iturina* Stempffer & Bennett, male (*28198a, b*); (114, 115) female (*30396, 30397*); (116, 117) *semliki* Stempffer & Bennett, male (*28190b, a*); (118, 119) *reducta* Stempffer & Bennett, male (*28191b, a*); (120, 121) female (*30404, 30405*); (122, 123) *dorotheae* Stempffer & Bennett, male (*28189a, b*); (124, 125) *overlaeti* Stempffer & Bennett, male (*28314, 28315*); (126, 127) *campimus campimus* Holland, male (*28187b, a*).

A New Liptenine Genus (Lep., Lyc.) Stempffer & Bennett

PLATE 5

FIGS. 128–135. Uppersides and undersides, respectively, of *Falcuna*: (128, 129) *campimus campimus* Holland, female (*30392, 30393*); (130, 131) *campimus dilatata* Schultze & Aurivillius, male (*30402, 30403*); (132, 133) *lybia* Staudinger, male (*28186a, b*); (134, 135) female (*30394, 30395*).

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A New Liptenine Genus (Lep. Lyc.) Stempffer & Bennett

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REVISIONAL NOTES ON AFRICAN *CHARAXES* (LEPIDOPTERA : NYMPHALIDAE) PART I

V. G. L. VAN SOMEREN

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 13 No. 7
LONDON: 1963

REVISIONAL NOTES ON AFRICAN *CHARAXES* (LEPIDOPTERA : NYMPHALIDAE)
PART I

BY

V. G. L. VAN SOMEREN

The Sanctuary, Ngong, Kenya

Xif

Pp. 195–242 ; 19 *Plates* ; 5 *Text-figures*.

BULLETIN OF
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REVISIONAL NOTES ON AFRICAN *CHARAXES* (LEPIDOPTERA : NYMPHALIDAE) PART I

By V. G. L. VAN SOMEREN

CONTENTS

SYNOPSIS

Two complexes, two species and their races of the genus *Charaxes* are dealt with in this paper in which eleven new subspecies, one new form and one new variety are described and two subspecies synonymized.

During the period 1898–1900 the late Lord Rothschild, assisted by Dr. Karl Jordan, published the famous *Monograph of Charaxes and allied Genera*. Excellent as it was, it left some groups in an unsatisfactory state, due largely to lack of knowledge of the early stages, breeding habits and ecology of its members.

Fortunately, this group of Nymphalines has always been a focus for field workers and systematists, and very large collections have been accumulated during the past fifty years. The genus *Charaxes* is particularly well represented in Africa and, with the opening up of this vast continent, many more species were brought to light, and it was soon realized that many of these had evolved into geographical races in different parts of the country.

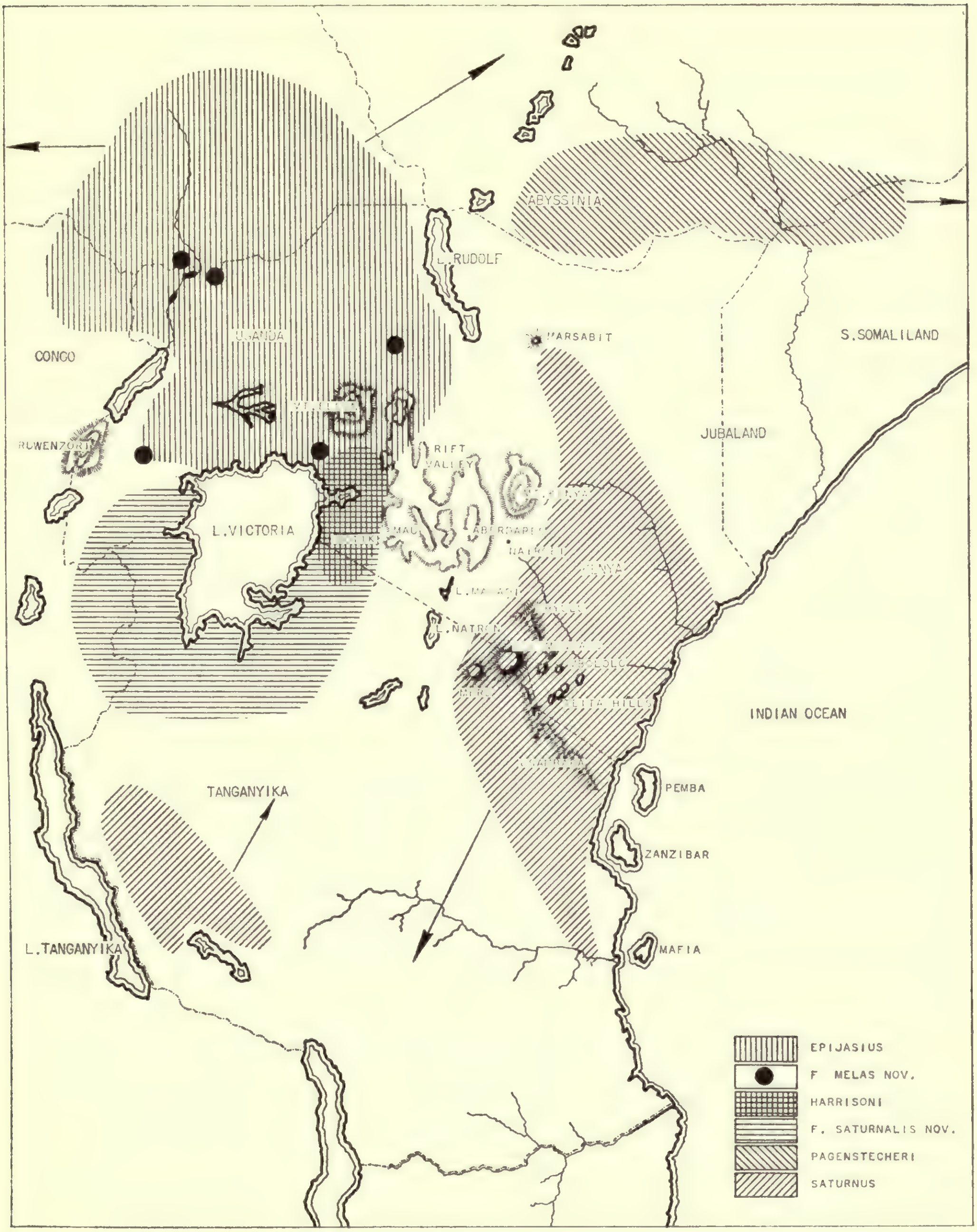
The last comprehensive account of the genus *Charaxes* was that by Aurivillius in Seitz (1925 : 122–141). This was based largely on Rothschild and Jordan (1898–1900). In 1952 Dr. Wallace Peters produced his *Check List of the Ethiopian*

Butterflies, bringing the list of known African *Charaxes* up to date at that time. The arrangement adopted was largely that of the British Museum (Natural History). During the past decade certain groups have been further revised in the light of recently acquired knowledge. Revisions of recent years have tended to be on a Pan-African basis, rather than localized, and this is as it should be.

1. The *Charaxes jasius-epijasius-saturnus* Complex

The writer, in collaboration with Mr. T. H. E. Jackson of Kitale, Kenya, has paid considerable attention to certain " complexes " which seemed to call for examination ;

Map 1. Distribution of *Charaxes jasius* L. and its subspecies and *Ch. pelias* Cramer.



MAP 2. Distributional relationships of *Charaxes jasius-epijasius* Reiche to *melas* forma n., and to *harrisoni* Sharpe and *saturnalis* forma n.

the *Charaxes jasius-epijasius-saturnus-pelias* complex is one of them. In order to try to work out this problem, considerable material was brought together, but it soon became evident that actual type specimens, or photographs of them, or topotypes, would have to be examined before a true picture was possible. Several museums and private individuals have assisted to this end.

Up to date, this complex seemed fairly straight-forward. Two species were recognized : *Ch. jasius* with *epijasius* as a race, and *Ch. pelias* with race *saturnus*, each with many forms.

In 1904 Miss Sharpe described *Charaxes harrisoni* as a species. She compared it with *jasius* and *epijasius*. Heron (1909), when reporting on the butterflies taken by the Ruwenzori Expedition 1905–06, stated that *harrisoni* Sharpe was related to *saturnus* and not to *epijasius*. In my series of papers on the Butterflies of East Africa and Uganda, I too associated *harrisoni* with *saturnus* and showed that there was some intergrading between what I took to be *harrisoni* and a dark form of non-typical *saturnus*.

When Wallace Peters (1952) published his *Check List*, he placed *harrisoni* as a race of *pelias* Cramer. The picture had been complicated still further by Heron (1909) who referred to a melanic *Charaxes*, taken by the Ruwenzori Expedition, as an aberration of *Ch. epijasius*. Although it had some resemblance to *harrisoni*, this fact was not mentioned. Two melanistic *Charaxes* taken by Jackson at Metu, West Nile, in 1954, showed some characters of *epijasius*, which was present in the area in some numbers. Jackson took another specimen at Kacheliba, Suk, a year or so later, and yet another was captured on the Tororo Hills, Budama, Eastern Uganda. These specimens agreed in the main with the example placed by Heron in *epijasius*, but at the same time they showed affinity to *harrisoni* Sharpe, which, as I have indicated, merges into a dark *saturnus*-like insect. These facts raised the question of possible relationship between *epijasius* and *saturnus* Butler.

The type of *harrisoni* Sharpe is in the Hope Department of Entomology, Oxford. Through the kindness of Professor Varley, I was supplied with a photograph of this type. It agrees in every particular with the specimens I had identified as *harrisoni* as reported in my 1928 paper. Nevertheless, other specimens taken at the same place and at the same period showed every stage of transition toward a *saturnus*-like insect. Other examples of *harrisoni* (typical) have been taken since, in the Trans-Nzoia and South Kavirondo country, and always in association with *saturnus*-like specimens.

From a study of the literature and very many specimens from Africa south of the Sahara, it would appear that only in the Trans-Nzoia and South Kavirondo areas of Kenya does *epijasius* actually meet and interbreed with " *saturnus* ", giving rise to *harrisoni* and the new form *saturnalis* (see below). I can find no record of contact and overlap between *epijasius* and *pagenstecheri* Poulton of southern Abyssinia, between *epijasius* and *brunnescens* Rothschild of North Angola and Gabon, nor between *epijasius* and *liberiae* Le Cerf in Liberia (c.f. comments on *liberiae* below).

Having studied all the material available to me, ranging from typical *jasius* of the Mediterranean sub-region to *pelias* of Cape Colony, together with the relevant literature and photographs of types, I have reached the conclusions set out below.

Although the extremes at the two ends of this complex look so different above, (and might not readily cross if brought together), the undersides have the same basic pattern, modified in the several races. The genitalia are similar. There are analagous cases in other butterflies, as there are in birds, and natural crosses between two distinct species are rare in Nature. Still, when two extremes are linked by intermediate forms, one can only assume that the extremes are conspecific.

As the oldest name in the complex is *Charaxes jasius* (L.) (not *jason* L., a junior homonym *teste* N. D. Riley *in litt.*) this name is adopted for the species which ranges from the Mediterranean Basin to South Africa, excluding the Cape Province. It is probable that the race *saturnus* is ancestral to *jasius*.

Descriptions and Notes

Charaxes jasius jasius (Linné)

(Pl. 1, figs. 1, 2)

Papilio jasius Linné, 1767 : 749.

Ground colour of fore and hind wings dark brownish-black ; fore wing with indication of darker discal bars, postdiscal spots orange ; hind wing with whitish patch near costal border, dusted with brownish scales ; admarginal border of both wings deep orange-ochreous, divided by black-scaled veins. Hind wing with small admarginal blue spots, often vestigial ; more developed in the female which is larger than the male.

There is some variation in the intensity of the ground colour and in the development of the postdiscal orange spots.

Charaxes jasius epijasius Reiche

(Pl. 1, figs. 3, 4)

Charaxes epijasius Reiche, 1850 : 469.

Male. Ground colour usually darker than *jasius*, often with a slight purply bloom ; usually without any post-discal orange spots in the fore wing ; admarginal border paler, more ochreous. Hind wing with large pale blue triangular spots, almost a patch, widest at vein 4 and tapering to 7.

Female. Similar to the male but larger.

The following varieties and aberrations have so far been recognized:

(a) Very similar to the nominate *epijasius* but with a series of post-discal orange spots in fore wing . . . . var. ***maculatus*** Suffert 1904 : 122
Occurs amongst typical *epijasius* throughout the distribution, but fore wing spots variable. Senegambia to Uganda, NW. Kenya . . . . . . Pl. 3, fig. 14

(b) Very similar to typical *epijasius* but blue spots in hind wing reduced in size or almost absent. NW. Kenya and Uganda . . . . . . Pl. 3, fig. 13

(c) Pattern similar to typical *epijasius* but basal areas of both wings greyish-brown ; underside with greenish tint. A pathological aberration.
var. ***murina*** Le Cerf 1923 : 364
Pl. 2, fig. 7

(d) A semi-melanic variety, showing reduction in the width of the ochreous borders which are dusted with dark scales. Blue in hind wing reduced. NW. Kenya and Uganda.

(e) Very similar in pattern to typical *epijasius* above, but with strong black scaling in the blue of the hind wing and on the marginal border ; underside normal pattern disrupted by heavy black scaling but in a definite pattern. This variety is mainly melanistic below. Type from Senegal . . . ab. ***feisthameli*** Le Cerf 1923 : 364
Pl. 1, figs. 5–6

(f) A melanistic variety in which the marginal border is reduced, particularly in the fore wing, to a series of small spots. The post-discal orange spots are clearly indicated, especially toward the costa, but the discal orange marks are almost obscured. In the hind wing the border is also reduced, especially toward the anal angle, where it becomes greenish. The submarginal blue spots are reduced in size though distinct ; the triangular sub-costal mark is clearcut and often whitish.

This variety, which is mainly melanistic above in contradistinction to *feisthameli*, which is mainly melanistic below, occurs sporadically within the range of typical *epijasius* in Uganda from West Nile to Suk and the Mokia plains SE. of Ruwenzori.
var. ***melas*** **var. n.**
Pl. 2, figs. 9, 11 and 12

It is of interest to note that when Heron (1909 : 155) reported on the specimen from Mokia he said " this is a variety of *epijasius* with the pale blue spots in hind wing reduced to a few spots ; it corresponds to *harrisoni* Sharpe, a variety of *saturnus*".

Charaxes jasius harrisoni f. ***harrisoni*** Sharpe

(Pl. 2, fig. 10 (Type) ; Pl. 3, figs. 17, 18 (Suna, S. Kavirondo) ; Pl. 3, figs. 15, 16 (Lugari, Trans-Nzoia [Transitionals.])

Charaxes harrisoni Sharpe, 1904 : 133.

The original description reads as follows :

" Allied to *Ch. epijasius* and the European *Ch. jason* Linn. (i.e. *jasius*) but differs from the former species in having a distinct submarginal row of orange-buff spots on the fore wing. The blue on the hind wing is more restricted than in the former species, although more strongly marked than in *jason*. Male : fore wing, the whole of the basal area chestnut-brown ; discal area brownish, relieved by a transverse line of chestnut spots from costa to as far as the inner margin, and situated between the nervules. The orange-buff border on the hind wing agrees with that of *epijasius*, but is decidedly narrower. Hind wing ground colour brownish-black suffused near the base with dull chestnut ; about the centre of the costal margin is a very distinct white patch suffused with chestnut, the lower portion of which becomes narrower, bright chestnut-brown and terminating above the radial nervure. The submarginal line of blue spots deeper in colour, but narrower than in *epijasius*. The orange-buff marginal border not so broad. The underside similar to that of *Ch. epijasius*. Expanse 3,1 ". Habitat (type locality) Kamagambo, South Kavirondo, Jan. 24th. 1903."

It will be noted that this insect presents features which unite it with both *epijasius* and *saturnus* : to the former by its wide ochreous marginal borders and its relatively conspicuous blue in the post-discal area of the hind wing ; to *saturnus* by its conspicuous orange-ochreous post-discal spots and obvious, though more obscured, discal series and the conspicuous ochreous mark near the costa of the hind wing. However, the similarity to *saturnus* seems to have escaped the attention of Miss Sharpe.

In my view, *harrisoni* is an intergrade between *epijasius* and a dark *saturnus*-like insect and is found in the area where the two overlap and interbreed. This is an area extending from the Trans-Nzoia to the east and south-east of Lake Victoria. Away from the direct influence of *epijasius* the dark *saturnus*-like insect becomes more stable and appears to have developed almost racial characters, though an occasional " throw-back " may be found with a large blue area in the hind wing similar to *epijasius* (Pl. 5, fig. 25). Although *harrisoni* (typical) is in a minority within the range of this dark insect, the name has to be utilized for the race of *jasius* found in the east and south of Lake Victoria extending through north-west Tanganyika and west Uganda. Thus the two forms may be designated *jasius harrisoni* f. *harrisoni* and the more widespread and constant members of the race will be known as *jasius harrisoni* f. *saturnalis* described below.

Charaxes jasius harrisoni f. ***saturnalis*** **forma n.**

(Pl. 4, figs. 20–24 ; Pl. 5, figs. 25–28)

MALE. General pattern as in *saturnus* but with darker richer chestnut at base of wings ; the black spots beyond the fore wing cell tending to form a more solid area ; the discal and post-discal spots richer orange ; the distal portions of the wings darker, more blackish ; the marginal ochreous-orange border considerably wider and often extending into area 1. Hind wing with marginal border wider and tending to become whitish in the region of the tails. The post-discal blue spots distinct, either a few small ones or large spots conjoined to form a wide blue zone.

FEMALE. Like the male, but larger, slightly paler, but with the same wide marginal borders. Underside as in *saturnus* but usually bolder.

Holotype male. KENYA : South Kavirondo, Suna, (*van Someren*) v–vi. 1931. in British Museum (N.H.).

Allotype female, same data.

Range : from east and south of Lake Victoria to its west shores as far as Katera and Masaka, and in Kigezi, SW. Uganda. In Tanganyika Territory : area south of Lake Victoria ; Shinyanga, Tabora district, and Geita.

Charaxes jasius pagenstecheri Poulton

(Pl. 7, figs. 35, 36)

Charaxes saturnus ab. *Pagenstecheri* Schultze, 1913 : 50.
Charaxes pelias pagenstecheri Poulton, 1926 : 570.

This race inhabits Southern Abyssinia and extends into Somalia. It combines some of the characters of *epijasius* with those of *saturnus*. It has a wide marginal border and a large blue area in the hind wing. The discal and post-discal spots in the fore wing are as in *saturnus*, but the basal areas of fore and hind wing are darker rufous chestnut. Within the black zone of the hind wing the blue is conspicuous ; commencing at the upper angle as a small spot it widens as the spots enlarge and become contiguous, forming a broad blue band which decreases in width at the anal

angle. The anal tail is unusually long and strong. The underside markings are strong, but there is rather less bluish-grey submarginally. Specimens I have examined are rather large, with fore wing length of 48–49 mm. One occasionally gets a specimen with only a few blue spots in the hind wing.

Charaxes jasius epijasius f. ***liberiae*** Le Cerf

(Pl. 2, fig. 8)

Charaxes pelias f. *liberiae* Le Cerf, 1923 : 365.
Charaxes pelias liberiae Poulton, 1926 : 570.

I have been unable to examine actual specimens of *liberiae* but I have a photograph of the unique type kindly supplied to me by the Paris Museum. Le Cerf placed this insect in " *pelias* Cr. f. (or subsp.?) ". The description states : base of the two pairs of wings blackish-brown as the disc ; median band pale ochre yellow ; submarginal spots of fore wing small and indistinct ; . . . blue spots in hind wing large (opposite tails) smaller above ; admarginal border ochre to olive-green. The underside as in *saturnus*, but darker olive. The marks in the fore wing cell are blacker.

This unique type seems to have certain features which associate it with *Ch. castor* Cramer, i.e. the dark ground colour of the wings above ; the pale ochre-yellow of the discal bar ; the reduction of the large admarginal ochre spots of the fore wing ; the narrow admarginal border of the hind wing ; yet the weight of characters favour " *saturnus* ", such as the shape of the fore wing which is less falcate than in *castor* ; the upper tail is comparatively long ; the blue spots in the hind wing are conspicuous ; the abdomen is slender and tapering.

From a distributional point of view it is interesting to note that *liberiae* is isolated by hundreds of miles from the nearest race of " *saturnus* ", namely *jasius brunnescens* Poulton, which does not seem to go beyond Gabon. On the other hand, *jasius epijasius* is found in abundance to the north of, and eastward of Liberia. My personal view is that *liberiae* is a marked aberration of *epijasius* on much the same lines as *epijasius* f. *melas* of Uganda.

Charaxes jasius saturnus Butler

(Pl. 6, figs. 29, 30)

Charaxes saturnus Butler, 1865 : 624.

Generally paler than *harrisoni* f. *saturnalis* of the southern portion of the Lake Victoria basin, and with narrower admarginal borders to the wings.

MALE. Base of wings bright rufescent-brown ; subcostal black spots beyond cell large and usually contiguous, that in cell distinct but variable in size ; discal bar in fore wing bright orange-tawny, slightly wider at hind margin, then almost uniform in width to 3, then narrower and inclined toward costa ; post-discal series of orange spots clear, but slightly variable in size, longest toward costa and extending to 2 where the spot usually touches the discal spot in that area. Admarginal border orange tawny, usually fairly narrow, but variable, broken by black

veins. Hind wing with a triangular orange mark, with its base on costa and its apex reaching vein 4 ; distal portion of wing black, with a variable number of blue spots, quadrate or oval, small or obsolescent above vein 4 ; admarginal border orange-tawny above upper tail, becoming whitish or bluish-white toward anal angle. Tails long and thin, lower tail usually outwardly curved. Wing length 40–44 mm.

FEMALE. Larger than the male and often paler. Wing length 46–50 mm.

There is some variation in tone of the basal areas of both wings, fresh specimens being richer and brighter. There is a general tendency for the ground colour of the fore wing to become gradually darker as the race extends northward from Natal to Kenya. Similarly, there is a tendency to darkening in specimens from north-west Northern Rhodesia, on the Angolan frontier (Pl. 6, figs. 31, 32).

Charaxes jasius saturnus var. ***laticinctus*** Butler

(Pl. 6, figs. 33, 34)

Charaxes saturnus var. *laticinctus* Butler, 1895 : 252.

Described from Kondeland, this variety, distinguished by its wider admarginal borders, occurs sporadically within the range of typical *saturnus*.

Charaxes jasius brunnescens Poulton

(Pl. 7, figs. 37, 38)

Charaxes pelias saturnus Butler ab. *brunnesceus* [sic] Rothschild, 1900 : 445.
Charaxes pelias brunnescens Poulton, 1926 : 570.

Originally described as "*pelias saturnus* Ab. loc.?", it is here treated as the local race of Northern Angola to Gabon and French Congo.

Characterized by its general richer coloration, the basal areas of the wings above are deep rufescent-brown tending to dark chocolate at the base ; discal band orange-tawny, deeper than *saturnus*, the postdiscal spots smaller and darker. The admarginal spots on the fore wing are large and rufescent-orange, those of the hind wing rufous at upper angle, then more whitish above the tails. Distal portions of the wings intense black, contrasting with the orange spots in fore wing ; the blue in the hind wing bold opposite the tails but small above. Underside more boldly marked than *saturnus*, the fore wing often with some orange on both sides of the discal white line. Female large and darker than *saturnus* especially at the base of wings ; discal fore wing bar wider and postdiscal spots more elongate especially toward costa. Wing length in males 45–47 mm., females 48–55 mm.

A small form, not quite so dark in colour, is found in southern Angola. The blue spots in the hind wing are darker blue. The fore wings are rather more acuminate. Wing length 39–40 mm. Pl. 6, figs. 31 and 32.

Charaxes pelias Cramer

(Pl. 7, figs. 39, 40)

Charaxes pelias Cramer, 1776 : 5.

Ch. pelias has for many years been considered a species and, hitherto, *saturnus*

Butler has been considered a race of it. This view was held by Rothschild (*op. cit.*), by Aurivillius (in Seitz), and by most subsequent writers. Wallace Peters adopts this same arrangement in his *Check List*, thus following the arrangement accepted by the British Museum (N.H.).

Messrs Gowan Clark and Dickson have bred both *pelias* and *saturnus* and are satisfied that, because of constant differences in the larvae at all stages, in the setae, the larval heads at all stages, and in the cremaster of the pupae, the two are distinct species. I have examined this evidence and admit that the differences are obvious. Clark further points out that the food plants of *pelias* are not those of *saturnus*. This may be supporting evidence, but not entirely reliable, since many *Charaxes* have several food plants, and in a given locality may prefer one species to another. Dr. van Son (*in litt*) considers that the differences noted by Clark are racial and not specific.

One must admit that the general facies above of the two insects appear to indicate some affinity suggestive of a common ancestor, but there is now a marked difference in shape, *pelias* being more " square ", with less falcate fore wings, less angled at the anal angle of the hind wing ; it also has much shorter tails, and the discal band on fore and hind wing is broader, above and below, and the ground colour below, especially of the distal half, is greyer.

If we take these differences, in conjunction with the evidence of distribution, *pelias* being limited to the Cape Province and not coming into contact with *saturnus* at any point, one is, I suggest, justified in ranking *pelias* as a full species without any known races.

The conclusions reached in the foregoing discussion can be summarized in the following Systematic List.

Systematic List

Charaxes jasius (L.)

Ch. jasius jasius (Linné), 1767. Type locality : Barbaria. Range : Mediterranean countries including N. Africa.

epijasius Reiche, 1849. Type locality : " Abyssinia ". Range : Northern Abyssinia, westward to Sudan, NW. Kenya, Uganda, Uelle district of Congo, French Central Africa, Niger, Dahomey, Ivory Coast, Sierra Leone, Guinea, Senegal.

var. *maculatus* Suffert, 1904. Konakry, Guinea. Amongst typical *epijasius* throughout the range.

ab. *murina* Le Cerf, 1923. Guinea. Pathological aberration.

ab. *feisthameli* Le Cerf, 1923. Guinea. A melanistic aberration mostly apparent on underside.

var. *melas* var. nov., Uganda, a melanistic var. occurring here and there amongst typical *epijasius*.

f. *liberiae* Le Cerf, 1923. Type locality : Liberia. Unique type ; status doubtful.

harrisoni Sharpe, 1904. Type locality Kamagambo, S. Kavirondo.

f. *harrisoni*. Trans-Nzoia to South Kavirondo, Kisii and Suna, where it intergrades with . . .

f. *saturnalis* forma n. Type locality : Suna, South Kavirondo, Kavirondo, extending to country south of Lake Victoria to Masaka on the west shore and to Kigezi in SW. Uganda.

pagenstecheri Poulton, 1926. Type locality : S. Abyssinia. Range : Southern Abyssinia to Somalia.

saturnus Butler, 1865. Type locality : " Interior of Africa ". Range : Transvaal, South Africa (except the Cape Province) extending to Mozambique, Rhodesias, Nyasaland, Tanganyika Territory, the coast and savannah country of Kenya to the Tana River north to Marsabit.

var. *laticinctus* Butler, 1895. Type locality : Kondeland, occurs here and there throughout the range of typical *saturnus*.

brunnescens Poulton, 1926. Type locality : " North Angola ". Range : North Angola, Gabon, west corner of Congo and " French " Congo.

A small dark form occurs in southern Angola (vide notes).

Charaxes pelias Cramer

Ch. pelias Cramer, 1775. Type locality : Cape Colony. Range : South Africa, in the Cape Province.

2. THE *CHARAXES FULVESCENS-ACUMINATUS* COMPLEX

When I wrote my series of papers on the *Charaxes* of Kenya and Uganda (1928–1939), there existed some confusion as to the relative status of *Ch. fulvescens* Aurivillius and *Ch. acuminatus* Thurau. There was some evidence that representatives of these two overlapped in certain areas. The paucity of material of topotypical *acuminatus* left the problem unsolved. However, I drew attention to the fact that in the south Elgon-Nyanza area two insects flew together, one with more or less straight outer margin to the fore wing, *Ch. fulvescens monitor* Rothschild, and one with more pointed acuminate wing tips ; and although there was an overlap, the latter showed a preference for the higher forests.

I gave figures of both insects, demonstrating the difference in shape and colour ; I also drew attention to, and figured, an insect with pointed acuminate wings as " near *acuminatus* " from the Kenya Highlands, Aberdares and upper Kikuyu.

In 1931 the Elgon-Nyanza insect was named *stonehami* by G. W. Jeffery, and in 1932 Talbot described the Mt. Kenya-Aberdare insect as *oreas* ; but the problem of *acuminatus* Thurau was left unsolved.

In 1939 when A. G. Gabriel reported on the butterflies taken by the Ruwenzori Expedition 1934–35, he cited certain specimens from Ruwenzori and east Belgian Congo, and Mt. Mkokanjero, " Nandi " (error, nr. Mbale, east Uganda) as *Charaxes fulvescens acuminatus* Thurau. With these he included specimens taken in the Mbuku

Map 3. Distribution of *Charaxes acuminatus* Thurau and its subspecies and *Ch. fulvescens monitor* Rothschild.

Valley by the Ruwenzori Expedition 1905–6, but excluded those taken on the low Mokia plains. He thus distinguished *fulvescens monitor* from " *acuminatus* ", quoting my observation that *monitor* is found at lower elevations and " *acuminatus* " at higher altitudes, but he failed to notice that in certain areas the two overlapped. Although, he pointed out the difference in the shape of the fore wing, he obviously did not have topotypical *acuminatus* Thurau before him when he assigned the Ruwenzori insects to this supposed race of *fulvescens*. In actual fact, the specimens he cites as " *acuminatus* " represent two distinct races, *stonehami* Jeffery and *kigezia* nov., which are not, in my opinion, conspecific with *fulvescens*.

In his *Check List*, Dr. Wallace Peters (1952) apparently follows the arrangement adopted by the British Museum (Nat. Hist.) and places *acuminatus, stonehami*, and *oreas* as races of *fulvescens*.

In the following notes I shall endeavour to show that *fulvescens* and *acuminatus* are two distinct species with a very considerable overlap in east and west Uganda, and that the latter, in various racial forms, extends from the Vumba Mts. in S. Rhodesia north to the Usambara Range in Tanganyika Territory, to the Shimba Hills in Kenya, north to Mt. Kenya, Mt. Elgon, then west to the Ruwenzori Range and eastern Congo ; a further race exists on the isolated Mt. Kulal, SE. of Lake Rudolf.

The smaller and paler insects with falcate and acuminate fore wings occur in the southern areas of distribution : Vumba Mts. in S. Rhodesia ; in southern Tanganyika Territory (Rungwe and the Livingstone Range north of Lake Nyasa) ; and on the high plateau west of Lake Nyasa. On the Usambara Range the insects are still pale but with less falcate though acuminate wings. The races darken as they range northward to the Shimba Hills, the Teita Range and Kilimanjaro ; still darker insects occur in the Kenya Highlands east of the Rift and north to Mt. Elgon and west to Ruwenzori ; all with acuminate fore wings.

With the exception of *acuminatus acuminatus, a. vumba, a. cottrelli* and *a. mlanji*, all of which are very distinct, the other races here described are represented by long parallel series which demonstrate the differences of the geographical races very clearly. It is true that individuals of a series can be seperated with a fair degree of agreement, but the aggregate of a given area is constant.

It will be noted that the descriptions are somewhat similar, the differences being based mainly on shape, colour tone, and degree of spotting, points clearly visible to the eye at a glance but difficult to convey in words.

It might be suggested that these localized colonies of *acuminatus* represent a series of clines rather than distinct geographical races, but the forest habitats are circumscribed and hundreds of miles apart, separated by bush and savannah and veldt. Moreover, it must be realized that the area covered by this review is larger than the whole of Western Europe . Taking into consideration our knowledge of the terrain and what obtains in other species of butterflies, it is considered best to regard each population of *acuminatus* as a distinct race.

Notes on Ecology and Biology

The various races assigned to *acuminatus* inhabit high or even montane forests throughout their distribution, in contrast to *Ch. fulvescens* and *Ch. varanes* which

occur in the lower forests or even in savannah and thus might be considered ecological races of the oldest named species *fulvescens*. But, as has been pointed out, there is considerable intrusion and overlap in both directions in certain areas, without interbreeding.

All these insects have similar habits. They frequent sunny openings and glades in the forest where they sit with partly open wings sunning themselves. When alerted, they close the wings. They select certain favoured " perches " and object to any intruders, flying after and driving them off, returning again to an exposed " stance ". When at rest, the wings are closed and the underside, which is variable, is highly cryptic. Like most *Charaxes*, they are very partial to certain " oozes " at wounds in trees infested with beetle or other larvae ; they come readily to hanging traps baited with fermenting banana. Most of them lay their eggs on species of *Allophylus* (Sapindaceae), mainly small under-storey or marginal trees and common in most of the forests. Young saplings and tender shoots are usually selected for egg laying, but as the larvae grow they move to older foliage. They rest on the upper surface of a leaf on which they have spun a layer of silk ; from here they move to adjoining leaves to feed, usually at night, returning to the silken pad to rest.

The larvae of *fulvescens*, *acuminatus* and *varanes* are unfortunately very similar, especially in regard to the " headpiece " but there are certain differences in ornamentation. The pupae of all are " top-shaped ", pale pellucid green, with little decoration except for opalescent white patches on the wing scutes and dark spiracular spots.

Descriptions and Notes

Charaxes fulvescens fulvescens (Aurivillius)

(Pl. 8, fig. 43)

Palla varanes var. *fulvescens* Aurivillius 1891 : 216.

Charaxes fulvescens monitor Rothschild

(Pl. 8, figs. 41, 42)

Charaxes fulvescens monitor Rothschild 1900 : 361.

I do not propose to give detailed descriptions of these two well-known insects ; it will suffice to draw attention to the figures given and stress the rounded apex and the almost straight outer margin to the fore wing. The race *monitor* is on the whole a much darker insect than the nominate form but in some areas the two tend to merge. On occasion one may find a light coloured insect in the Elgon region or in the Bwamba Valley. In the small scattered forested areas of South Kavirondo, the majority of specimens are much paler than those of western Uganda, and are in fact extremely like nominate *fulvescens*.

Charaxes "fulvescens" saperanus Poulton

Charaxes fulvescens saperanus Poulton, 1926 : 569.

The position of this insect is still in doubt. The shape of the fore wing, rounded

apex and straight outer margin (teste Howarth *in litt.*) is suggestive of relationship to *fulvescens* rather than *acuminatus*. No material has been available to me for study.

Charaxes acuminatus acuminatus Thurau

(Pl. 8, fig. 45, type female. Fig. 44, female)

Charaxes acuminatus Thurau, 1903 : 139, fig. 12.

Because of the confusion which has existed regarding nominate *acuminatus* Thurau, I have obtained permission from the Berlin Museum to reproduce the original figure of the type. It is a female with very acuminate-falcate fore wings with a curious flattening of the costa and a slight upward tilt before the tip. As stated in the original description, the orange spotting in the distal portions of the wings is obscured. The type specimen has remained unique for many years. Through the kindness of Mr. R. H. Carcasson, Entomologist to the Coryndon Museum, I have been able to examine a second female specimen captured in the southern Tanganyika Highlands, roughly 45 miles from the type locality. This specimen is assumed to be typical ; it has the same peculiar flattening of the costa before the upward-tilted prolonged apex as in the female type. This peculiarity of apical shape is indicated to a certain extent in the race from the Vumba Mts. and would seem to discount any suggestion that the female type is malformed. In this species, females always have more pointed acuminate fore wings.

FEMALE. *Upperside.* Fore wing length 49 mm., costa strongly curved, with a slight flattening before the apex which is acuminate and the outer margin falcate, but less so than in the Vumba race. Width of wing from base to end of vein 3, 36 mm.; at vein 1, 36 mm.; the outer margin is thus less incised and the hind angle less prominent than in race *vumba* (see below). Base of wing and inner portion of hind margin whitish with a slight greenish tinge, gradually and increasingly suffused with ochre orange over apex of cell and discal area ; distal portion of wing rufous-chestnut with a series of post-discal orange spots followed by a submarginal series following the contour of the wing. Dark marks are : thin linear mark basad in 6 with a broader mark in discal line, a broad linear mark sub-basad in 5 with a broader mark in discal line ; less obvious irregular dark marks sub-basad in 2 and 3 on discal line. Inner margin of dark distal area dentate. Hind wing basal half whitish with a slight greenish tinge, rather more clearly defined distally than in the Vumba race ; distal portion of wing darker rufous with the post-discal series of spots more diffuse, followed by ill-defined admarginal angular dark marks. Single tail at 4, 5 mm. long, spatulate at end. *Underside :* Fore wing basal area greenish-grey with ochreous tinge, more rufous washed in upper portion bordered by a discal dark line almost straight in its lower portion and slightly broken and zigzag toward the costa ; submarginal dark spots diffusely indicated, those toward apex more defined. Hind wing ground colour as fore, but dark discal line more defined inwardly and edged whitish outwardly, almost straight ; post-discal series of dark spots ill-defined except those in sub-costa in 6 ; those in 1c–2 at anal angle white-centred with black outline.

Charaxes acuminatus vumba **ssp. n.**

(Pl. 8, fig. 46)

The differences between this race and nominate *acuminatus* are : more falcate fore wing, hind angle more pronounced, outer margin more strongly incised ; base

of fore wing more suffused with ochreous, base of hind wing less white, more creamy.

MALE. *Upperside*. Fore wing length 45 mm., costa strongly curved, very slightly flattened before apex which is strongly acuminate ; outer margin strongly incised, with the hind angle very prominent ; width of wing from base to end of vein 3, 33 mm., at vein 1, 35 mm. Base of wing pale ochreous with a slight greenish tinge ; ochreous colour darkening slightly toward apex of cell to orange-ochreous ; distal half of wing rufous chestnut with a series of orange spots largest in 1b and diminishing in size to 5 ; distal to which are dark diffuse spots hardly visible. Other marks are : three slightly indicated dark spots subcostal in cell, a linear mark basad in 4 and another sub-basad in 4 followed by two larger spots in 5–6 ; inner margin of dark distal border dentate. Hind wing basal half whitish with a very slight ochreous tinge merging into stronger orange-ochreous, then darkening toward margin and distal portion of inner fold. Post-discal dark spots : a small one in 7, larger in 6, large oval one in 5 followed by smaller spots in 4–2, becoming obsolete in 1c. Single tail at 4 not spatulate at end. *Underside*. Fore wing basal half ochreous with a greenish tinge, separated from the distal duller rufescent half by a dark discal line, slightly inclined inward at mid-point then zigzag toward costa ; variable zigzag lines in cell, followed by a series of dark irregular lines basal and sub-basal in 2–4, 6–8 ; in the post-discal zone a series of paler linear spots with mid-dark dots. Hind wing ground colour as fore wing ; discal dark line almost straight, but slightly incurved at apex of cell ; linear and angled fine dark lines in basal half ; distal half of wing with a series of diffuse dark spots arranged in an angle opposite the tail. Spot in 7 darkest.

Holotype male, S. RHODESIA : Vumba Mts., 7.x.1940, (*B. D. Barnes*) in British Museum (N.H.), presented by Mr. B. D. Barnes.

RANGE. The Vumba Mts.

A second specimen which looks very like a female but in fact is a male, is slightly larger, wing length 46 mm., less strongly falcate. ground colour as in the type but with slightly paler borders, dark spots more defined and the orange-ochreous spots in the dark border clearer, and followed by a sub-marginal series of small spots. Hind wing as in the type but dark spots in distal half more distinct followed by an admarginal series of lunate dark marks especially above the tail. Underside as in the type but dark lines, spots and marks more developed and defined especially the dark almost straight discal line ; the post-discal spots above the hind angle small, linear and outlined in black.

I am indebted to Mr. B. D. Barnes of Umtali, S. Rhodesia for supplying me with material for this description, and for allowing me to deposit the type in the British Museum (N.H.).

Charaxes acuminatus mlanji ssp. n.

(Pl. 9, figs. 47, 48)

The Mlanji race, unfortunately represented by only two specimens*, shows an approach to the race *vumba* of Southern Rhodesia in general coloration but the shape of the fore wing is less acuminate-falcate and there is less flattening of the costa before the apex. The distal portion of the wings is darker but the orange spotting is smaller and ill-defined.

* An additional male and a female have since been secured by J. D. Handman of Limbe, Nyasaland. The female is very similar to the male, but is slightly paler and larger. Length of fore wing 60 mm.

MALE. *Upperside.* Fore wing length 40 mm., costa strongly curved at mid-distance, but not flattened toward apex ; apex acuminate, but outer margin not strongly incised. Basal half whitish, faintly tinged with greenish at base, rapidly shading into orange-brown in discal area then to dark brown in the distal portion. Dark brown discal marks sub-basal in 2, 3, 4, then spots conjoined beyond end of cell to form a narrow bar. Both rows of orange spots present but ill-defined and in between them diffuse dark marks ; a slight indication of dark ill-defined marks in cell. Hind wing more broadly white to just beyond the discal zone then merging into a narrow band of orange, then darkening to the border ; dark brown spots in postdiscal area not strongly marked and tending to be conjoined as a wavy bar ; admarginal dark spots hardly visible. Tail on 4, 7 mm., not spatulate at end. *Underside.* Basal area ochreous-brown up to a well marked discal dark line ; beyond to margin darker, with areas of satiny lustre. Dark line in hind wing slightly incurved at mid-length and with white border distad ; bar of fore wing curved inwardly at 2–3, ending in a series of dark marks to costa ; beyond this a series of dark spots from 1b to costa. Hind wing postdiscal spots large but ill-defined except that in 7 ; those in 1b–2 with whitish centres and dark ringed. The basal areas of both wings with irregular wavy dark lines between the veins.

Hollotype male. NYASALAND : Mt. Mlanji, between 3,000–4,000 ft. 30.i.1914 (S. A. Neave) in British Museum (N.H.).

Charaxes acuminatus cottrelli ssp. n.

(Pl. 9, figs. 51, 52)

MALE. *Upperside.* Fore wing length 45 mm. Costa strongly curved, apex acuminate, but without " flattening " of costa before apex. Width of wing from base to end of vein 3, 35 mm., at vein 1, 34 mm.; outer margin only slightly incurved. Base of wing bluish-white, veins greenish, but increasingly suffused with ochre-orange from base of cell to outer border ; marginal border dark rusty blackish carrying a series of dark post-discal spots following the contour of the wing, and a discal series of dark angular marks from 2 to costa ; internal to these there are dark angular marks sub-basal in 2–3 and transverse linear marks in cell with a bolder mark beyond apex of cell. The general impression is of fore wing orange marks being accentuated by adjacent elongate dark areas. Hind wing, basal half bluish-white rather sharply separated from broad orange border which carries a series of dark post-discal spots, most pronounced in upper half then fading out in 2 ; admarginal dark spots in areas above tail. Tail broad at base then tapering rapidly, not spatulate at end. The dark line of the underside shows through slightly at the distal edge of the whitish base. *Underside.* Light olive ochreous in basal half with some satiny pale areas in distal half. Discal dark line in hind wing pronounced, less strong in fore wing and fading out in a series of spots from 4 to subapex. A dark ocular spot in 6 ; fine dark lines in basal half of wings not pronounced except in cell of fore wing.

FEMALE. *Upperside.* Fore wing length 53 mm., costa strongly curved ; very similar to the male but apex more acuminate, fore wing spotting more obvious, and dark spots in hind wing contiguous, forming a zigzag bar. *Underside.* Rather more tinged with olive basally, but fine dark lines less in evidence.

Holotype male. NW. RHODESIA : Mwinilunga, in gallery forest at source of Zambesi River, 15.vii.1955 (*C. B. Cottrell*) in British Museum (N.H.) presented by Mr. Cottrell.

Allotype female. Same data.

Range. So far, only known from the Mwinilunga area west of the " copper belt " of NW. Northern Rhodesia.

The very pale appearance of this race is rather distinctive and the bluish-white basal area is in contrast to the golden-orange of the distal portion of the wing.

Charaxes acuminatus nyika ssp. n.

(Pl. 9, figs. 49, 50)

Superficially resembling the race *cottrelli* from NW. Rhodesia but generally darker in distal portion of wings.

MALE. *Upperside :* Fore wing length 49 mm., costa strongly curved, apex acuminate and with only a slight suggestion of "flattening" before the apex ; outer margin slightly incurved. Width of wing from base to end of vein 3, 35 mm., at vein 1, 36 mm. making the hind angle rather acute, less rounded and more prominent. Base of wing pale whitish but suffused with golden orange in increasing degree to disc of wing ; distal portion almost uniform dark rufous chestnut in which the golden ochreous spots of the post-discal zone show up distinctly ; the sub-marginal row less obvious and, in between, a series of dark spots ; the admarginal dark spots more diffuse. There is a small dark spot at the apex of the cell, a larger one just beyond and irregular large ones sub-basal in 3–6. Hind wing basal area whitish but with a distinct creamy tinge, with some of the dark lines of underside showing through ; the border is rusty-orange with a series of post-discal dark spots most distinct in the upper half and fading out in 2 ; admarginal dark spots distinct above tail, but obscured toward anal angle. Tail at 4 tapering, very slightly spatulate, 6 mm. long. *Underside.* Basal areas strongly ochreous with slight olive tinge ; distal area with some satiny pale areas especially in hind wing. Discal lines well marked, straight in hind wing but inwardly curved in hind portion of fore wing in 1b–2 ; from 5 to costa the line is zigzag. Series of postdiscal dark spots distinct but most marked toward subapex ; ocellate spot in 7 distinct, remainder indistinct and those at anal angle more elongate and white-centred.

FEMALE. Very similar to the male but larger. Fore wing length 53 mm. Fore wing postdiscal orange spots more elongate, paler.

Holotype male : NYASALAND : Nyika Plateau, 4,000 ft., Manchowe, 22.vii.1939, (*Rodney Wood*) deposited in British Museum (N.H.) by arrangement with National Museum Bulawayo.

Allotype female : same data. In British Museum (N.H.).

Paratypes in National Museum, Bulawayo, S. Rhodesia.

It would appear that the Rift in which Lake Nyasa lies, with low ground to the east and high plateau to the west has acted as a barrier and given rise to ecological races. It is significant that the races to the east are more alike than those to the west.

Charaxes acuminatus usambarensis ssp. n.

(Pl. 10, figs., 53, 54)

MALE. Nearest to the race *nyika* in degree of paleness, but with the light areas of the basal portion of the wings more suffused with orange scaling but the dark lines of underside showing through more clearly in both wings. The fore wing, orange spots are more clearly defined ; in the hind wing the post-discal dark spots are very distinct and are conjoined to the admarginal row by orange linear marks. Wing length 40–42 mm., costa strongly curved, apex less acuminate than in ***nyika.***

FEMALE. Larger than the male ; wing length 48 mm.; colour very similar but distal portions of the wings darker, obscuring the post-discal and submarginal orange and blackish spots.

Holotype male : TANGANYIKA TERRITORY ; Usambara Range, Amani, v.1950 (*T. H. E. Jackson*), in British Museum. (N.H.).

Allotype female same data.

Paratypes in coll. van Someren. Habitat, the heavier forests on the Usambara Range at about 4,000 feet.

Charaxes acuminatus shimbanus ssp. n.

(Pl. 10, figs. 55, 56)

Generally darker in the distal portions of the wings than *usambarensis* ; with basal pale areas more opaque and more in contrast but the orange spotting of fore wing less clear and defined, more elongate and with the admarginal series obscured ; dark spots in hind wing border more obscured.

MALE : *Upperside*. Costa strongly curved, very slightly " flattened " before apex ; apex acuminate, but outer margin not strongly incised. Fore wing length 44 mm.; width from base to end of vein 3, 35 mm., at vein 1, 33 mm. Basal half of wing whitish with an increasing amount of ochre-orange suffusion from about the centre of the wing ; distal portion rufous-chestnut darkening toward the outer margin, which is ornamented with two rows of orange spots ; the post-discal series rather elongate, the admarginal hardly visible ; the intervening dark spots hardly defined from the dark ground. Indistinct wavy dark lines of underside just visible in the basal pale area. Hind wing basal whitish area extending to just beyond the dark discal line of underside, which shows through slightly ; distal area suffused with orange and merging into the darker border, which carries a complete series of dark rounded spots, largest in the upper half and diminishing in size toward the anal angle ; a series of less distinct spots in the admarginal zone. Tail at 4 relatively short, 6 mm., tapering gradually but not spatulate at end. *Underside*. Basal areas of both wings ochreous, shading darker toward the dark discal lines, which are very marked ; the basal area with fine dark blackish lines between the veins, most marked in the cell and sub-costal area. Distal portions of wings with a strong satiny lustre especially in the hind wing ; fore wing with a series of small postdiscal dark spots, those in hind wing dark ringed with pale centres, those toward subcostal areas most distinct, those in anal angle whiter ; admarginal zone with small dark dots.

FEMALE. Larger than the male, fore wing length 48–50 mm., costa slightly more curved before apex, which is more acuminate ; outer margin rather more incurved. General colour scheme like that of male, but sometimes with a slightly darker shading on distal half of hind wing. Fore wing orange postdiscal and submarginal spots smaller ; the dark spots rather obscured by the dark ground. Underside similar to the male but ground colour may be darker.

Holotype male, KENYA COAST : Shimba Hills, Makadara forest, 1,000–1,500 ft., Kwale District, x.1960 (*van Someren*), in British Museum (N.H.).

Allotype female ; same data.

Paratypes. In coll. van Someren and in British Museum (N.H.).

Range : the forest areas of the Shimba Hills 1,000–1,500 ft., flying in association with *Ch. varanes* Cramer which, however, is more plentiful in the low forests and bush at sea-level.

Charaxes acuminatus teitensis ssp. n.

(Pl. 10, figs. 57, 58)

Colour pattern generally similar to the preceding race, but differing markedly in the intensity of colours ; a more defined bluish-white basal area and a darker distal border.

MALE. *Upperside.* Shape of fore wing very similar to *shimbanus* but costa slightly more curved ; apex more acuminate ; outer margin slightly more incised. Fore wing length 47 mm. (very occasionally smaller) thus usually larger than *shimbanus* ; width of wing from base to end of vein 3, 36 mm., at vein 1, 36 mm. Basal half bluish-white, distally suffused with orange-ochre to discal area then very dark rufous-chestnut, almost blackish toward the margin. Postdiscal spots distinct but submarginal series only slightly indicated. Other marks are : a curved linear dark line at end of cell, followed by a quadrate spot in 5 beyond which are sub-basal angled spots in 2–5 ; two large orange spots at about mid-point in 5–6. Hind wing basal area bluish-white rather sharply defined from distal dark border, which is rufous along the postdiscal series of dark spots then darker, more blackish, beyond to margin ; admarginal dark spots hardly visible in the dark ground. Tail at 4 comparatively short, robust and not spatulate, 5–6 mm. long. *Underside.* Darker than in *shimbanus*, more olive-greyish with ochreous wash ; zigzag lines less distinct but discal bars in hind and fore wing well defined ; postdiscal spots usually clear or may be ill-defined in fore wing, though well defined in hind wing.

FEMALE. Larger than the male ; fore wing length 55 mm.; apex more acuminate and outer margin more incised. General pattern as in the male, spots more defined in fore wing ; those in hind wing more obscured. Underside as in the male, but usually darker.

Holotype male. SW. KENYA : Teita Hills, Chawia Forest, 5,000 ft., ii.1956. (*van Someren*), deposited in British Museum (N.H.).

Allotype female. Same data.

Paratypes. In coll. van Someren.

Range : Throughout the Teita Hills in forest areas from Dabida to Bura Bluff and Chawia forest. Also on Mt. Mbololo nearby. Also found on the Chyulu Range and on Kilimanjaro and Mt. Meru.

Charaxes acuminatus oreas Talbot

(Pl. 11, figs. 59, 60)

Charaxes fulvescens oreas Talbot, 1932 : 181.

This is the largest race of *acuminatus* and though closely resembling *teitensis*, is readily distinguished by the more strongly curved costa and more acuminate apex and incised outer margin. There is no contact between the races.

MALE. *Upperside.* Shape of fore wing costa strongly curved beyond mid-distance, apex strongly acuminate, outer margin markedly incurved. Fore wing length 47–50 mm.; width of wing from base to end of vein 3, 37 mm., at vein 1, 37 mm. but apex prolonged. Basal area less whitish than *teitensis*, being progressively suffused with orange ochre, strongest toward the discal zone, darkening in the distal half to dark rufous chestnut in which the orange postdiscal and submarginal spots show up clearly. Sub-basal dark spots in 2–5 large and clear and a black curved line at apex of cell. The dark ground colour obscures the black spots between the orange spots. Hind wing : basal area bluish-white with a slight ochreous tinge becoming strongly

orange-tawny in the discal zone up to the row of large black post-discal spots ; submarginal series of light spots obscured. Tail at 4 robust, of about equal width throughout, 7 mm. long. *Underside.* Rather variable, but generally similar to the Teita race, though usually rather darker, but satiny lustre areas more apparent distad to the discal lines, which are not very strong ; that on fore wing slightly curved to 6 then inclined toward the costa in a series of spots or broken lines ; that on hind wing almost straight ; zigzag dark lines in basal area present ; submarginal spots in hind wing not very distinct except the white ones toward the anal angle.

FEMALE. *Upperside.* Shape very similar to the male but costa more curved distad, apex more acuminate, outer margin more incised. Fore wing length 56 mm. General coloration similar to male but submarginal spots in fore wing more obscured and dark post-discal series in hind wing less apparent. Tail longer, robust, slightly spatulate. *Underside.* Ground colour as in the male though usually darker ; markings similar.

Range : East Rift, common on the Meru side of Mt. Kenya and extending to the Aberdares especially in the south : Katamayo forest. Uplands of Karita forest, upper Kikuyu ; occasionally taken in the Karura forest near Nairobi. Within this distribution one does on occasion find specimens which approximate very closely to *stonehami* of the Elgon-Mau area, having a strong suffusion of orange to the basal area of the fore wing. It would thus seem that the Rift has not acted as an efficient barrier between *stonehami* and *oreas* ; nevertheless, it must be noted that *oreas* does *not* occur in the Elgon-Mau area.

***Charaxes acuminatus kulalensis* ssp. n.**

(Pl. 11, figs. 63, 64)

A few rather worn specimens of *Ch. acuminatus* from the isolated Mt. Kulal, taken some years ago, gave indication that the race on that mountain differed considerably from any other East African race. Fortunately a good series of both sexes in fresh condition was recently taken on Mt. Kulal by H. D. van Someren in time for inclusion in this review. The characters of this race are very constant.

MALE. *Upperside.* Fore wing costa strongly curved in distal half, apex acuminate, outer border incised but hind-angle not accentuated. Length of fore wing 46 mm., width of wing at vein 3, 38 mm., at vein 1, 36 mm. Base of wing slightly bluish-white, rapidly shading into orange-ochre in the disc, but contrasting with the distal half of the wing which is very dark, almost blackish, and carrying a series of obscured orange spots in the post-discal and submarginal zones. Hind wing basal half bluish white with a slight tinge of ochre wash but sharply defined from the discal orange band which merges into the dark distal border in which is a series of black submarginal spots, large at the upper angle then diminishing in size to the anal angle ; there is an indication of a narrow blacker admarginal line ; the fringe is orange-tawny with white spots on either side of the base of the tail on vein 4 which is 6 mm. long, not spatulate. The very dark distal borders, with the basal areas, especially in the hind wing in strong contrast, accentuate the main dual colours of the upperside. *Underside.* Ground colour strongly olive-grey-brown with the basal zigzag dark lines not well marked except in the fore wing cell ; the fore wing discal line clearly marked and narrowly white-edged, strongly curved outward to 5, then angled and inclined toward the costa ; submarginally a series of satiny dark spots following the contour of the wing. Hind wing discal line almost straight from end of vein 8 at costa extending to hind angle and ending in a V, distal to which are two to three conspicuous white spots continued up the submarginal zone as satiny ocular spots most pronounced at the upper angle sub-costal area.

FEMALE. Larger than the male, wing length 55 mm. *Upperside.* Colour and pattern as in the

male, but with the small orange spots post discal and submarginal in fore wing more defined; the bluish-white basal area of hind wing more strongly bluish. *Underside.* As in the male but satiny areas more evident, especially the quadrate patch in fore wing cell, and the ocular submarginal series of spots in fore and hind wing.

Holotype male. KENYA: Northern Frontier Province, at Mt. Kulal, SE. Lake Rudolf, v–vi.1961 (*H. D. van Someren*), deposited in British Museum (Nat. Hist.).

Allotype female. Same data, also in British Museum (N.H.).

Paratypes in British Museum (N.H.) and in coll. van Someren, Kenya.

This race appears to be limited to the forests on Mt. Kulal and does not, so far as has been observed, occur on Mt. Marsabit where in fact no race of *acuminatus* has been taken.

Charaxes acuminatus stonehami Jeffery

(Pl. 11, figs. 61, 62)

Charaxes fulvescens stonehami Jeffery, 1931: No. 4.

This race is characterized by its slightly smaller size compared with *oreas*; its greater degree of orange suffusion to the fore wing almost to its base; comparatively restricted white area in the hind wing with corresponding greater width of the orange border.

MALE. *Upperside.* Fore wing slightly less acuminate than in *oreas*; fore wing length 46–49 mm.; width from base to end of vein 3, 34 mm., at vein 1, 32 mm., outer margin incurved, and apex acuminate. Basal area with hardly any whitish but strongly suffused with orange, increasing in density toward discal area, then darkening to margin; dark spots obscured; orange spots in post-discal zone fairly well marked but those in the sub-marginal area more obscured, due to the strong rufescent tone of the outer border. Hind wing whitish area rather restricted and slightly washed with ochreous becoming more rufescent toward outer border; the large dark post-discal spots show up clearly; admarginal spots obscured. Tail at 4, robust, not spatulate, 7 mm. long. *Underside.* Similar in most respects to *oreas* but ground colour paler and more rufescent; zigzag dark lines variable and less strongly marked; postdiscal dark spots in fore and hind wing rather obscured. Discal bar not strong; but as in most cases where the underside is procryptic in character, heavy black scaling may occur, thus obscuring the basic pattern.

FEMALE Only slightly larger than the male, but similar in shape, with apex of fore wing slightly more pointed. *Upperside.* Pattern and ground colour very similar, but the dark spots in postdiscal zone of hind wing more obscured. *Underside.* Generally similar to the male, but ground colour usually darker.

Range: South-east to west Elgon, North Nyanza: Kabras, Kakamega, Kaimosi, extending to South Kavirondo, Chepalungu, Sotik and on the Mau, west of the Rift. But it does extend into the Rift on the Kamasia Hills, thence to the north Aberdares and Mt. Kenya, where it meets with *oreas*.

Charaxes acuminatus kigezia ssp. n.

(Pl. 12, figs. 65, 66)

MALE. Nearest to *stonehami*. *Upperside.* Characterized by the same strong orange suffusion to the base of the fore wing restricting the white to the base of the hind margin. Hind wing with

white area similarly reduced but the distal borders of both wings darker, more blackish almost obscuring the orange spots in the fore wing and the dark spots in the hind wing. The dark distal portion of the wings accentuates the whitish basal areas. Fore wing length 47–49 mm.; apex pointed but outer margin not strongly incurved. *Underside* generally darker than *stonehami* especially in the apical half of the fore wing ; discal bars stronger and the ocellate post-discal spots in hind wing strongly marked.

FEMALE. Larger than the male, wing length 50–52 mm., slightly paler at the base, but distal borders dark, almost black ; orange spots in fore wing clearer than in the male especially the post-discal series ; apex of fore wing acuminate ; outer margin fore wing and hind wing more scalloped, wavy.

Holotype male, SW. UGANDA : Kigezi, Mafuga Forest, Rutenga, ii.1958 (*van Someren*), in British Museum (N.H.).

Allotype female, same locality, vi.1958.

Paratypes. In coll. van Someren and in British Museum (N.H.).

Range : Ruwenzori and its foothills to Kigezi in SW. Uganda : Mafuga, Rutenga, Ruhiza, Kayonza.

Charaxes acuminatus subsp.

There is one other apparently undescribed race of *acuminatus* still requiring investigation. Unfortunately, it is represented by two very worn specimens only and a detailed comparison is impossible. These two specimens are from the Loita-Nguruman Plateau, S. Masai district of Kenya. The orange and dark spotting in the distal portions of fore and hind wings is strongly marked in these, thus showing a similarity to *usambarensis* of Tanganyika Territory.

It is probable that when more of the isolated montane forests have been thoroughly investigated, especially those of southern Tanganyika Territory, other races of *acuminatus* will be discovered.

SYSTEMATIC LIST

As a result of this critical study of the *Charaxes fulvescens-acuminatus* complex, the following classification is submitted :

Charaxes fulvescens Aurivillius

Ch. fulvescens fulvescens Aurivillius, 1891. Type locality : Cameroons. Range : West Africa, Sierra Leone, Cameroons to Gabon.

monitor Rothschild, 1900. Type locality : Unyoro, Uganda. Range : Gabon to Congo and Uganda and NW. Kenya.

saperanus Poulton, 1926. Type locality : Grand Comoro I.

Charaxes acuminatus Thurau

Ch. acuminatus acuminatus Thurau, 1903. Type locality : Lagenberg, Livingstone

Mts. Range : Rungwe and Livingstone Mts. north end of Lake Nyasa.

vumba ssp. n. Type locality : Vumba Mts., Southern Rhodesia.

mlanji ssp. n. Type locality : Mt. Mlanji, south of Lake Nyasa, Nyasaland.

cottrelli ssp. n. Type locality : Mwinilunga, west of Solwezi, west of the " Copper Belt " North-west N. Rhodesia.

nyika ssp. n. Type locality : Manchowe, Nyika Plateau, 4,000 feet. Range : Nyika Plateau, west side of Lake Nyasa.

usambarensis ssp. n. Type locality : Amani area Usambara Range, Tanganyika Territory.

shimbanus ssp. n. Type locality : Makadara For. Shimba Hills, Kwale Dist., Kenya. Range : throughout the high forests, Shimba Hills.

teitensis ssp. n. Type locality : Chawia Forest, Teita Range. Range : all forested areas and on Mt. Mbololo, also on Kilimanjaro Meru and the Chyulu Hills.

oreas Talbot, 1932. Type locality : Meru, Mt. Kenya. Range : Meru, NE. Mt. Kenya to southern Aberdares, Upper Kikuyu, the Karita Forest, Katamayo, Kenya Highlands.

kulalensis ssp. n. Type locality : Mt. Kulal, SE. Lake Rudolf, in Montane Forest.

stonehami Jeffery, 1931. Type locality : SE. Mt. Elgon. Range : the west, south and south-east slopes of Mt. Elgon, the Mau and Cherangani to S. Kavirondo ; West Mt. Kenya.

kigezia ssp. n. Type locality : Mafuga Forest, Kigezi, SW. Uganda. Range : the foothills of Ruwenzori, Bwamba Valley, Humia Valley, Toro, Mafuga, Ruhiza, Kayonza, in Kigezi.

In addition, two rather worn specimens from the Loita-Nguruman Plateau, southern Masai, Kenya, cannot be placed to any of the races listed above. Fresh material is required.

3. *CHARAXES PYTHODORUS* HEWITSON AND ITS RACES

The main object of this note is to clear up some of the confusion which appears in literature regarding the races of this species and their respective distributions. We note that Rothschild & Jordan (1900), referring to the two supposed races of *pythodorus*, state : " the differences between the two geographical races . . . are not conspicuous, but seem to be pretty constant "; but on reading the descriptions and the respective distributions we find that both are confusing because incorrect ; thus the characters cited for the race *nesaea* Grose-Smith appear to be based on specimens from Rau, Nandi, and not on insects from Mombasa, Kenya Coast (type locality). The Nandi examples come within the variations of *pythodorus pythodorus* and actually belong to that race. Thus the description given for *nesaea* is incorrect. Aurivillius in Seitz (1912 : 131) appears to follow this faulty description.

Aurivillius refers to the insect as " very rare "; it is certainly nowhere common, but has a very wide distribution, and is found from Nigeria and French Equatorial Africa (Congo) to Angola, south and eastern Congo to Uganda, then along the coast of Kenya and Tanganyika. It is not an inhabitant of dense tropical forest but is found in secondary forests, gallery forests, heavy savannah, and even in light savannah where forest-crowned kopjes or thickets occur.

The food plants, so far as I know, are species of *Craibia* (Leguminosae) ; *C. brevicaudata* Dunn on the Kenya and Tanganyika coasts, *C. elliotti* Dunn in the Nyanza

Map 4. Distribution of *Charaxes pythodorus* Hewitson and its subspecies.

Basin, and *C. brownei* Dunn in the Elgon-Uganda east area. Many *Charaxes* have an alternative food plant, often belonging to a different family, and where *Craibia* may not occur it is possible that *Brachystegia*, much sought after by several *Charaxes*, may be an alternative food of *pythodorus*, such as in the dry " Miombo country " of Tanganyika Territory.

DESCRIPTIONS AND NOTES

Charaxes pythodorus pythodorus Hewitson

(Pl. 12, figs. 67, 68)

Charaxes pythodorus Hewitson, 1873 : 57.

The type specimen is a male, without exact locality, but I have before me the Angolan male and female mentioned by Rothschild & Jordon, ex Berlin Museum, taken at Pungo Andongo, 1875, (*von Mechow*). There is a further male taken at Angola, Kebela. Except for a slightly more incised fore wing in one of the Berlin specimens there is little difference in pattern, except sexual, in these specimens ; one male shows some blue scaling linking the discal and postdiscal spots in 3–4 in fore wing, which is lacking in the type. Following is a redescription of this nominate sub-species.

MALE. *Upperside.* Fore wing length 40–43 mm., ground colour black, slightly brownish toward base ; a white or bluish-white spot at apex of cell ; a discal series of bluish-white spots, elongate and small in 5–6, more quadrate in 3, more elongate in 1a–2 and more bluish and contiguous with bluish spots in 1a–1b (occasionally 2) of post-discal series and forming a blue triangular patch at hind border ; the rest of the postdiscal spots, diminishing in size, continue through to the costa, set in slightly in 4–5 then inclined at an angle to the costa. Hind wing basal area bluish-white, more strongly blue distad with outer edge slightly serrated ; border widely black, narrow at anal angle then widening to costa. The width of this border varies slightly in individuals but is usually 10–11 mm. wide at vein 4–5 then wider at upper angle in 6–7. The border carries a series of bluish or whitish dots sub-marginally, the dots being larger toward the upper angle. *Underside.* Ground colour generally ochreous-clay colour with narrow blackish zigzag lines in the basal area, especially in the basal half of the fore wing cell ; whitish spots of upperside indicated below, sometimes black outlined distally ; a black mark semicircular or solidly black present in sub-base of 1b with another in same area but distad to the pale discal spots, solid or crescentic in shape, often with a dark crescentic inner more diffuse mark extending to the hind margin, the two forming an " eye-spot " at the tornus. Hind wing ground colour as fore wing ; a few wavy black lines in basal areas, followed by a pale zone distally flanked by an irregular dark diffuse zone made up of contiguous angular marks ; in the sub-margin are white dots corresponding to the pale spots of upper side. Thorax above in fresh specimens blackish with a slight greenish tinge, distally bluish fringed, abdomen bluish white above, below ochreous clay throughout.

FEMALE. *Upperside.* Very similar to the male but larger, fore wing length 45 mm.; fore wing straighter on the outer margin, but hind angle more rounded ; hind wing more rounded. The ground colour is not so black, but with a slight brownish tinge ; spots and pale areas not so blue, more whitish, especially those of fore wing. Hind wing dark border wider, 12–14 mm. at vein 4–5. *Underside.* Ground colour as in the male, or often paler, with the pale spots of upperside showing through clearly. In the hind wing there is indication of a discal band, paler in colour than the ground, distally bordered by an irregular darker zone similar to that in the male ; in the sub-margin are small white dots.

Range : The general range of the nominate subspecies is from Angola to the Katanga area of the Congo, NW. Northern Rhodesia northward to Kivu and into Uganda and the north-west portion of Kenya, then to the southern area of the Lake Victoria basin. In Uganda, specimens are recorded from Katera forest, Mawakota, Mlanji, Mabira, Bufumbo, West Elgon, Jinja ; in Kenya from East Elgon, Kitale, Nandi, Elgeyo Escarpment, Tembach, Lenbus, Lugari in Trans-Nzoia, Kaimosi, Kabras, Kakamega, and Kacheliba. Occurs also in the Kisii area on the Gori River and has been taken in the Geita district of Tanganyika Territory south west of Lake Victoria.

The descriptions are based on Angolan specimens, but those from the localities cited above exhibit no constant characters distinguishing them from nominate *pythodorus*. (Uganda specimens are figured on Pl. 12, figs. 69 and 70.)

Charaxes pythodorus occidens **ssp. n.**

(Pl. 13, figs. 71 (type), 72 (var.)

Specimens from the French Congo (on the Congo Cameroon border) and from Nigeria differ from the nominate subspecies by being slightly smaller (fore wing length 38–40 mm.) and, though the general pattern is similar, having the pale areas of a more intense blue. (Some examples show a tendency for the discal and post discal blue spots to be conjoined, the spot in 4 joined to that at apex of cell, pl. 13, fig. 72.) The hind wing blue area is more extended, thus reducing the width of the marginal black border very considerably : 6 mm. at vein 4–5 ; submarginal spots slightly larger and more distinct and bluer. The underside exhibits hardly any difference from the nominate subspecies, the wavy black lines are slightly more pronounced.

FEMALE. At present unknown.

The Nigerian specimen has slightly more incised fore wings but otherwise agrees with the Ouesso, Mambili specimens from French Congo. Of the 9 males taken in the French Congo, 4 exhibit the conjoined spots in the fore wing.

Holotype male. FRENCH CONGO : Ouesso, Mambili, vii.1960 (*T. H. E. Jackson*) in the British Museum (N.H.).

Range : French Congo and the western region of Nigeria at Dordan. These specimens extend the range of the species north and westward for a considerable distance. There is also a specimen from the Gold Coast in the British Museum (N.H.).

Charaxes pythodorus nesaea Grose-Smith

(Pl. 13, figs. 73, 74)

Charaxes nesaea Grose-Smith, 1889 : 132.

This is the smallest subspecies, with well defined characters separating it from other subspecies.

MALE. *Upperside.* Fore wing length 35–36 mm., ground colour black with only a slight tinge of brown at base ; blue areas strongly coloured, only slightly paler in the spot beyond the cell. Blue area in hind margin forming a definite triangle reaching at its apex to vein 2 ; post-discal blue spots in a straighter line than in nominate race, and strongly blue. Hind wing extreme base blackish but discal blue area more extended, thus reducing the marginal dark border, and strongly

blue in colour, though slightly paler along the inner margin and whiter at sub-costa in 6. The reduced marginal black border is 6 mm. wide at 4–5, thus much narrower than in the nominate race, though Rothschild & Jordan (*op. cit.*) states that the border is wide! Submarginal blue spots clearly defined margin with a very narrow blue line from anal angle to vein 6. *Underside.* Ground colour as in nominate race but dark crescentic mark at sub-base less strong and that at tornus not so solid and less heavy.

FEMALE. Very similar to the male, but larger; fore wing margin straighter; hind wing more rounded at anal angle. Pale areas and spots less blue and more whitish though more strongly blue than in nominate subspecies especially distally in the hind wing. Distal black border in hind wing narrow as in the male, 4–5 mm. wide. Underside as in the male, but post-discal dark band more pronounced.

Neallotype female. KENYA COAST: Shimba Hills, x.1960, van Someren coll., in British Museum (N.H.).

These descriptions are based on topotypical Kenya Coast specimens; examples from the Usambara Mts., Tanganyika Territory, are similar though more strongly marked below as a rule The female has not hitherto been described.

Range: This subspecies is limited to the Kenya and Tanganyika coast zone and does not extend inland*. Specimens placed to this race by Rothschild and Jordan from Rau-Nandi do not belong here. Specimens have been taken on the Rabai Hills and at Ribbe and the forests of the Shimba Hills in Kenya; but the species is not common. It was noted to be more plentiful on the Usambara Mts. in Tanganyika Territory.

Charaxes pythodorus pallida Carpenter

(Pl. 13, figs. 75, 76)

Charaxes pythodorus pallida Carpenter, 1934: 12.

When Carpenter first described this race in 1934, he omitted to state the sex, but subsequently recorded it as a male. He was still under this impression when he referred to "four other male specimens" in the Hope Department, Oxford (Carpenter, 1945: 84). The photograph of the type kindly supplied by Professor Varley suggested that the type, by its shape and coloration, must be a female. Mr. Taylor of the Hope Department kindly examined the type on my behalf and he confirms that it is a female, by the form of its fore legs.

Through the kindness of Professor Varley I am now able to give a description of the male taken in the same general locality as the type female.

MALE. *Upperside.* Fore wing length 35 mm. (thus within the range of *nesaea*), outer margin of wing slightly incised. Ground colour blackish in the distal half and earth brown at the basal areas. Pattern of the wing as in the nominate subspecies but discal spots almost white with just a tinge of blue proximal to areas 1a–1b; post-discal spots pale blue, the bluish area at hind-margin not so angled in 1b–1c as in the ssp. *nesaea*. Hind wing basal areas widely whitish with just a tinge of blue distally, the black border reduced in width to 6 mm. at vein 4–5 and hardly widen-

* An interesting specimen of *pythodorus* has recently been received from the Japanese Scientific Expedition to Kigoma, on the east shore of Lake Tanganyika. This unique male specimen is very similar to *nesaea* but is larger: fore wing length 40 mm. On the hind wing the marginal blue line is conspicuous and extends to vein 7. Further material may show that these characters are constant and that the eastern Lake Tanganyika insects are a distinct race.

ing at 6 near costa. Sub-marginal spots small and whitish. Anal angle more pronounced than in other races. *Underside.* Ochreous-clay colour, paler than in other races, with some whitish at the hind-margin between the sub-basal and tornal dark marks in 1b; the diffuse dark post-discal bar not strongly marked, and the pale sub-marginal spots hardly at all visible.

FEMALE. Larger than the male, 36–38 mm., hind wing more rounded at anal angle. *Upperside.* Pattern similar to the male but more whitish, the post-discal spots in fore wing dull bluish; the submarginal pale spots in hind wing hardly visible. *Underside.* Slightly paler than in the male and with the discal bars in fore and hind wings more apparent; that of the hind wing bordered by an irregular dark brownish zone; submarginal pale spots faintly indicated.

The description of the female is taken from a specimen from Singida.

As the true male has not previously been defined I designate :

Neallotype male. Specimen taken by Burtt, TANGANYIKA TERRITORY, between Tabora and Kazi-Kazi Station, Central Railway, iii.1933, D. Burtt coll. in Hope Dept., Oxford.

Range : this subspecies would appear to be a small dry-country form derived from *nesaea*, as suggested by Carpenter, 1945. It inhabits the dry savannah and " miombo bush " country of north-central Tanganyika Territory away from the humid influence of the south Lake Victoria basin. It has been taken at Singida but the bulk of the material comes from the country along the central railway line between Kazi-Kazi, Itigi and Tabora. The extent of its range southward is not known.

SYSTEMATIC LIST

Charaxes pythodorus Hewitson

Ch. pythodorus pythodorus Hewitson. Type locality : " Angola ".
occidens ssp. n. Type locality : Ouesso, French Congo.
nesaea Grose-Smith. Type locality : Mombasa, Kenya.
pallida Carpenter. Type locality : Kazi-Kazi Central Railway, Tanganyika.

4. *CHARAXES DRUCEANUS* BUTLER AND ITS RACES

Because of the apparent confusion surrounding the nominate race of *Charaxes druceanus* and its distribution, it is desirable at the outset to have a " background " picture of this species, and to obtain this one must refer to some of the early literature.

Butler described the species in 1869 from a specimen said to have been taken in " Old Calabar ", Southern Nigeria. The type is a male in the British Museum (Natural History) and was figured by Butler in the following year (*Lep. Exotica* plate x, fig. 4). In the same year Hewitson described *Charaxes cinadon* from Natal, the type being then in the Ward collection. A specimen from this collection is now in the British Museum and Mr. Riley tells me that it is probably the type of *cinadon*, though not so labelled. It agrees well with the South African material. Butler seems to have lost no time in synonymizing *cinadon* with his *druceanus* and from 1870 to

1900 numerous authors record *druceanus* from Angola, the Rhodesias, Transvaal and Natal.

These early references are set out in detail by Rothschild & Jordan (1900 : 415–6) and need not be repeated here ; suffice it to say that *cinadon* Hewitson is treated as a synonym of *druceanus* by all these writers. However, it is interesting to note that Rothschild & Jordan (1900 : 417) state " that Natal specimens have the black colour of the upperside, on the whole, rather more extended than individuals from Angola and the Congo "; but they follows this up with the remark : " whether the species really extends to Old Calabar, whence the type is said to be from, is more than doubtful ".

Aurivillius (1899) gave the distribution of *druceanus* Butler as Old Calabar, Congo, Angola, Natal, Transvaal, Nyasaland and Zambesi. He repeats this again in Seitz (1911 : 128). Thus up to 1911 only one race, the nominate, was recognized. More recent references may now be considered. Rebel (1914 : 253) described a race from north-west of Lake Tanganyika, Kivu Province, which he called *obscura*. The description is very meagre but the main characters are : " very much darker chestnut-brown upper surface, and with a narrower pale brown outer margin " (discal bar) compared with nominate *druceanus*. I have a colour photograph of one of the four " types ", kindly supplied by the Vienna Museum, to which I shall refer later.

Joicey & Talbot (1922 : 338) described the Rhodesian and south Congo insect as *proximans*, the male type from Mt. Mlanji, the female type from " Uganda "! Before giving the characters of this race they state : " the West African and South African (insects) are typical *druceanus druceanus* Butler," thus endorsing the view expressed by Aurivillius, except that E. Angolan examples are attributed to this new race. A glance at the map of Africa will show that the only line of communication between Nigeria and Transvaal would be down the western side of Central Africa via the Cameroons, Gabon, Angola west, thence to the Cape and the Transvaal ; a possible, but highly improbable route, since much of the country is unsuited to the species. Morever, within the Union of South Africa other races occur which will be considered later in this paper. Joicey & Talbot give the range of *proximans* as Nyasaland, Rhodesia, Angola, South Congo (Katanga), thence northward to Uganda, but they note that a specimen from Toro, Uganda, approaches the West African race. They apparently overlooked the fact that in 1914 Rebel had described the race *obscura* from just west of Uganda (Kivu area) and that Toro lies within this ecological zone. At a later date (1925) Jordan described the Kivu insect as *kivuanus*, and in 1932 Le Cerf gave the name *cryanae* to the Kivu race. The inclusion of " Uganda " within the range of *proximans*, and more especially the fact that Joicey & Talbot designated a " Uganda " female as type in this sex, influenced us (van Someren & Rogers, 1928, Nos. 33–34 : 3) in determining the East Uganda-Elgon specimens as *proximans* Joicey & Talbot, but with certain reservations in that we noted that specimens from north and east Elgon showed a marked difference from topotypical *proximans* which suggested that they probably represented a distinct race. We overlooked the fact that in 1926 Lathy had separated off the Elgon-Mau race as *septentrionalis* !

In " Butterflies of Kenya and Uganda " (van Someren, 1935 : 178), I made the statement that *septentrionalis* Lathy came from Toro, Uganda, based on information

given to me at that time ; this was wrong, the Toro insect being *obscura* Rebel. However, Gabriel (1939) records a specimen from Namwamba Valley, east Ruwenzori, as *septentrionalis* (so identified by Jordan) and not *obscura* Rebel (syn. *kivuanus* Jordan) although the insect came from within the Kivu zone.

MAP 5. Distribution of *Charaxes druceanus* Butler and its subspecies.

In 1936 Jordan added yet another race to *druceanus*, from the eastern Transvaal, *moerens* of the Drakensberg Mts., and in 1939 I described the race *teita* from the Teita Range, South Kenya.

Dr. van Son informs me (*in litt.*) that there are possibly two other undescribed races in South Africa, and these I shall consider in due course.

In the revision which follows an attempt is made to evaluate the several described races by a critical examination of topotypical material, photographs of type specimens, and a study of geographical and ecological data. A very large amount of material has been brought together and my indebtedness to contributors is duly acknowledged at the end of this paper.

Notes on Ecology and Biology

Charaxes druceanus is widespread, extending from Guinea and Nigeria in West Africa to Kenya Colony in the east, but with an apparent break in the central Congo, thence south to the Transvaal and Natal. In my experience *druceanus* is found in close association with its food plant, species of *Syzygium* (Myrtaceae) of which the following are recorded as food : *S. cordatum* Hochst., *S. guineensis* DC., both widespread in Kenya ; *S. mumbwaensis* Greenway ; *Eugenia* sp. (Myrtaceae) and *Bersama* sp. (Melianthaceae). Most of the Myrtaceae are riparian trees, occurring on banks of rivers, streams and swamps, but also found in forest. This species is therefore found, in the main, outside dense forest, preferring the outskirts, or frequenting gallery forest. The males are fond of sunning and sporting on the tops of high trees, or ascending to the top of a tree-clad hill and playing around, driving off intruders from their favoured perches. The females will stay in the vicinity of their food trees, but both sexes will come readily to baited traps and may travel quite a distance from areas with known food trees in search of fermenting juices on which they feed in nature, usually an ooze from an infected tree ; thus specimens may occasionally be taken in an area where they are not expected to be.

Descriptions and Notes

Charaxes druceanus druceanus Butler

(Pl. 14, figs. 77–81)

Charaxes druceanus Butler, 1869 : 4.

For purposes of this description I have selected a male example from Old Calabar, kindly lent to me by the British Museum (N.H.), and I have before me two other examples from West Africa, Guinea and Gabon, which agree in all essentials.

Male. *Upperside*. Fore wing length 40 mm. more acuminate-falcate than in *cinadon* ; base of fore wing light chestnut brown lighter than in *cinadon* Hewitson (Natal) and not so orange as *proximans* Talbot (Nyasaland). The distal portion of the basal area carries black spots as follows : one rounded spot subcostal toward end of cell, a quadrate elongate spot at end of cell, larger

contiguous spots sub-basal in 5–6 and a smaller one slightly distad in 4, blunted triangular large spots sub-basal in 3 and 2 with a smaller one below in 1b. An orange-tawny discal bar 9 mm. wide at hind margin gradually lessens in width to 5 then divides into a Y, the outer arm continuing up to the costa in almost a straight line, the inner arm inclined inward through 6 and 7 but not reaching the costa, the interspace filled with a black inverted triangle. Distal border black with marginal tawny-rufous spots separated by black at end of veins. Hind wing basal area light chestnut-brown darkening slightly at costa followed by an orange-tawny discal bar, 6 mm. wide at costa where it is slightly paler, then narrowing slightly to above the anal angle ; border of wing black, widest at 4 ; admarginal tawny-rufous contiguous lunules partially separated by black veins ; extreme edge black. Anal angle with two purply-blue spots, blue spots sometimes present in 2–3, but variable. *Underside.* Ground colour of basal area fore and hind wing bright chestnut ; fore wings patterned by black bars outlined in silvery white, three in cell, a larger double one beyond cell, a large oval black mark in sub-base 1b with longitudinal silver streaks in centre, a black bar silver outlined sub-base in 2 with a crescentic mark just beyond, with another above it sub-basal in 3, these contiguous with the inner edge of the conspicuous silvery-white discal bar which more or less follows the inner half of the orange-tawny bar of above, including the Y which has central black linear marks. The outer half of the bar is orange tawny, paler toward the margin, but outwardly bordered by a conspicuous series of submarginal black triangular to linear marks, large at tornus and diminishing in size to sub-apex, marks widely silvery-grey outwardly ; margin dull orange-tawny broken by dark veins. Hind wing, basal chestnut crossed by silvery linear marks, wide at the costa then tapering and joining with a narrower mark crossing sub-apex of cell and extending down toward anal angle ; inner fold traversed by three silvery lines conjoined at base and merging into the end of the discal silvery bar which is wide at the costa, distinctly curved on inner edge and tapering rapidly to above the anal angle. Distal to the silvery bar the ground colour is light chestnut traversed by a wavy silvery-grey irregular line touching or separate from a series of silvery-grey lunules distally black on the sub-margin ; admargin dull orange-tawny, ending in a large anal double spot with silver centres ; margin black.

There is some slight variation of the underside of the other two males, but within the general basic pattern.

The male specimen from Lower Guinea (*Pogge*) (Pl. 14, figs. 79, 80), although old and somewhat worn, exhibits certain interesting features suggestive that *druceanus* in that territory may be represented by a distinct subspecies.

Upperside. Fore wing length 38 mm., costa rather more curved than nominate race, wing more falcate ; base paler and more orange-rusty, margin not so black and narrower, due to the wider discal band which is 10 mm. wide at hind margin and 1b, very slightly less in 2, 6 mm. in 3, and the Y is correspondingly wider. In the hind wing the basal area is paler than in the nominate race and the discal band is wider, particularly so in 2–4. *Underside.* Paler rufous, with the black marks clearer, but silvery bars less in contrast except in the hind wing submargin.

It is regretted that no actual female is available for a detailed description. Published descriptions are unreliable owing to the confusion of races, especially between *cinadon* and nominate *druceanus* of West Africa.

As mentioned in the introduction, Rothschild & Jordon seem to have been the first to cast doubts on the authenticity of the locus of Butler's type *druceanus*. Because of the rather lax and somewhat indifferent method of recording localities in the early and mid 19th century, it is now very difficult to adduce supporting evidence for the data on labels attached to the specimens. One has therefore to rely on such facts as are visible : characters of the insects involved, the number of specimens on record from the area, the name of the collector and so on. I have examined material from

Guinea, S. Nigeria and Gabon ; on only one specimen is the name of the collector given, i.e. " Dr. Pogge ", 1881, Lower Guinea, who, as it is well known, made early collections on the West Coast.

Dewitz mentions *druceanus* taken by Pogge & Güssfelt in Guinea. Other specimens are recorded from the Bates and the Staudinger Collections.

It seems justifiable therefore to assume that the species *druceanus* does occur on the West Coast of Africa. Having examined actual specimens and compared them with South African material, I am satisfied that West African *druceanus* do not agree with South African examples.

Charaxes druceanus tectonis Jordan **stat. n.**

(Pl. 17, figs. 103, 104)

Charaxes tectonis Jordan, 1937 : 323.

Charaxes tectonis Jordan is placed as a species at the end of the *xiphares* group by Wallace Peters (1952) although in the original description it is compared with *Ch. druceanus* and *Ch. eudoxus* Drury.

A few years ago, I asked Mr. T. H. E. Jackson to examine this unique type, and to form an opinion as to its affinities. His view was that it certainly belonged to the *druceanus* complex. I have now received photographs of the upper- and undersides of this insect, kindly supplied by the British Museum (N.H.). There is little doubt that the insect belongs to the *druceanus* group, judged by the upperside pattern, and though the underside diverges considerably from the orthodox *druceanus* pattern it conforms to certain variations found in races of *druceanus* in eastern Africa, for example, the vars. *alicea* Stoneham and *lugari* van Someren in the race *septentrionalis* Lathy. As the type (from Bamenda Division, Msungli) is unique, it is impossible to suggest if *tectonis* is typical of a Cameroon race, or a variation. The original description is as follows :

" Male, near *Ch. eudoxus* Drury 1782 and *Ch. fallax* Richels 1913, but in the tawny markings of the upperside rather closely resembling *Ch. druceanus kivuanus* Jord. 1925 ; the tawny colouring in anterior half of fore wing much more extended, isolating black spots in cell and on disc, as in *druceanus*, the tawny band being forked anteriorly, its outer branch slightly curved and maculate, consisting of 4 rounded spots, the proximal branch of 2 spots, the tawny band centrally with indications of blackish spots. On hind wing the tawny orange admarginal band much narrower than in any known form of *Ch. eudoxus*, black submarginal band of almost equal width throughout, bearing in posterior half 4 blue dots as in *Ch. d. kivuanus*, and at anal angle a buffish green admarginal bar as in *Ch. druceanus* ; tails narrow and rather long, especially the anterior one, longer than in *Ch. eudoxus*. Markings of underside of the *Ch. eudoxus* type, not as in *Ch. druceanus* ; on fore wing three black cell bars margined with silver, first consisting of two small dots, on disco-cellulars a fourth bar, broader, parallel with third and as far separated from it as is second bar ; below cell a silver margined bar between median veins, a somewhat smaller one behind it a little more basal with silvery margin incomplete. The discal series of black bars consists of an anterior one from sub-costa to R2, nearly all silvery, composed as in *Ch. eudoxus* of three sections and a subcostal streak, the next two bars inclining toward cell, much narrower than broad and silver margined ; below these bars follow two small black spots with white margins vestigial, one below the other far separated from the antemedian spot, whereas in

Ch. eudoxus and *Ch. fallax* the black spots below lower median vein and cell are large and usually confluent or connected with one another ; the orange tawny band corresponding to one on upperside consists of rounded spots paler than the costal area on both sides of the silvery costal bar, inconspicuous, the upper four bounded on proximal side and on the veins by bluish-grey, this scaling continued as a line toward hind margin of wing, but quite inconspicuous and more whitish in the pale posterior area ; the posterior orange-tawny spots completely merged together as a band which is widened to the black bars behind R2, being divided only by the greyish line just mentioned ; on distal side the orange-tawny spots contiguous with the black spots, last three merged together into a large transverse patch bearing three bluish-grey spots, the one before the patch rounded triangular, shorter than its distance from distal margin and like the other five small ones margined with bluish-grey. Hind wing like fore wing, paler than in *Ch. eudoxus* and *Ch. fallax*, transverse lines as thin as in *Ch. fallax*, outer half of wing remarkably different : the white discal line crossing R2 close to the bend of this vein entirely separated from the silvery median bars, broader and more diffuse than in *Ch. fallax*, not containing any black bars except before abdominal margin ; the band outside this line dull ochreous-tawny, bounded on distal side by black bars of which the anterior ones are straight, the others luniform ; the narrow admarginal buffish orange band bounded on basal side by black bars, the first nearly straight, the others curved with distal side convex, these bars and those of the preceding row form ten rings, filled in with bluish grey scaling, one at anal angle bearing two white dots, the one before posterior tail somewhat smaller, with one white dot near its outer margin, these ocelliform spots corresponding to similar spots in *Ch. druceanus*."

It will be noted that in the above description frequent mention is made of similarity, in varying aspects, to *Ch. druceanus*, and in the reduction of silvery lines and bars to *Ch. eudoxus*. However, in view of the variation which we know takes place in some races of *druceanus* the balance of evidence is in favour of *tectonis* being a sub-species of *druceanus*.

Charaxes druceanus cinadon Hewitson **ssp. rev.**

(Pl. 14, figs. 82–84)

Charaxes cinadon Hewitson, 1870 : 177.

Male. Fore wing length 38–40 mm., less falcate than *druceanus* from Guinea. *Upperside.* Pattern essentially similar to the nominate *druceanus* but the whole tone of the basal areas and the discal bars is richer and darker. The discal bar of the fore wing is slightly less straight on its outer border while the inner margin is indented strongly by the much larger black marks at the bases of 1b, 2 and 3. The admarginal light spots in fore and hind wing are larger and thus more conspicuous. The fore wing bar is 8 mm. at the hind edge, slightly less in 2, then tapers rapidly to the bifurcation in 5. *Underside.* Pattern as in the nominate race but bolder ; silvery bars in fore wing cell wider, black spots larger ; the inner edge of the silvery discal bar of hind wing straighter, the chestnut spot at costa larger and more distinct ; the postdiscal and submarginal silvery-grey wavy lines bolder.

Female. Fore wing length 41–45 mm. *Upperside.* General pattern as in the male but basal areas slightly paler and the discal bars considerably paler orange-ochreous, and wider ; marginal spots paler. Average width of fore wing bar at hind edge 10 mm. in 1a–1b, slightly less in 2 and 3, narrower in 4 just at bifurcation ; inner margin strongly indented by black bases to 2–3, rather suffused on outer margin with orange-tawny where it meets the black outer border. *Underside.* As in the male, but all marks larger and bolder.

Hewitson described this Natal insect shortly after *druceanus* had been described by Butler who synonymized *cinadon* with *druceanus*. From that time on, even up to

1922, this association of the two seems to have received support (*vide* Talbot, *Bull. Hill Mus.* 1 : 338), but in my view this seems to be based on insufficient study of topotypical West African material.

Moreover, geographically the two races are widely separated, with other races intervening. The race *cinadon* is confined to the Natal district of South Africa south of Swaziland from the coast belt to 4,000 feet.

Charaxes druceanus moerens Jordan

(Pl. 15, figs. 89–91)

Charaxes druceanus moerens Jordan, 1936 : 333.

This is the darkest race of *druceanus*, characterized by its very narrow discal bars in both sexes.

MALE. Fore wing length 35–38 mm. *Upperside.* General pattern similar to the other races but ground colour considerably darker, more deep chestnut resulting in some obscuring of the black spots in fore wing cell and bases of areas 1b–4 and with a reduction in the width of the discal bar to 5 mm. in 1b and with the mark in 1a even smaller. Hind wing : with the reduction in width of the discal bar to 4 mm. at area 5 and only slightly bigger in 6, the black outer border is wider, measuring 8–9 mm. in area 6, the discal bar is obscured and fades out above the anal angle. The admarginal spots on fore and hind wing are smaller and darker than in other races. *Underside.* General pattern as in other races, but ground colour deeper chestnut with sub-basal black spots in areas 1b–3 larger and blacker ; the distal portion of the wing darker. In the hind wing the silvery discal bar though wide at the costa narrows rapidly and is more irregular on its border, moreover the chestnut spot on the costa is large and is often carried down to vein 4 thus dividing the bar in its upper half or entire length into two. The silvery-grey post-discal wavy line and the sub-marginal lunules are more conspicuous on the darker chestnut ground.

FEMALE : Fore wing length 43–46 mm. *Upperside.* Pattern as in the male, basal areas darker and distal borders blacker and wider than in other races, but the discal bars pale ochreous to orange-ochreous, and in the hind wing reaching only to area 2 ; admarginal spots pale orange-ochre. The coloration of the female is thus in strong contrast to the male, more so than in other races. *Underside.* General pattern as in the male, ground colour dark with black marks and silvery lines accentuated.

This dark montane race is mainly restricted to the higher elevations of the North Drakensberg Range at and above 4,500 feet but may stray lower, even within the altitude range of *cinadon*, but since it occurs mainly to the west and north west of Swaziland south of the Olifants River there is no overlap.

This race does, however, occur north of the Olifants River where the high escarpment becomes more fragmented and in the vicinity of Woodbush, Malta Forest and Haenertsberg there is a tendency for the specimens to be smaller, but this reduction in size is unstable and unaccompanied by any difference in colour or pattern. Many topotypical *moerens* are as small as material from north of the Olifants River, and many of the latter are as large as *moerens* from Mariepskop.

Gowan Clark is of the opinion that *moerens* is a species distinct from *cinadon*, but the evidence adduced is inconclusive. Moreover, the following race links characters of *moerens* with *stevensoni* and *proximans*.

Charaxes druceanus entabeni **sp. n.**

(Pl. 19, figs. 117–122)

There is no doubt that *druceanus* in the Zoutpansberg is represented by a distinct subspecies ***entabeni***, which occupies an area intermediate between *moerens* of theDrakensberg and *stevensoni* of the Vumba Mountains, with the Limpopo valley between the latter and *entabeni*. It is interesting to note, however, that female *entabeni* is nearer in general appearance to *stevensoni* than to *moerens* and that the male stands intermediate between the two, but with a marked tendency toward *moerens*.

MALE. Fore wing length 30 mm. *Upperside*. Superficially resembling the male *moerens* but generally less dark and with a wider fore wing discal bar, especially in areas 1a–3. Cell with three black transverse marks, one subcostal at about mid point, the second more linear and crossing the cell and may be contiguous with the black sub-basal mark in 2, the black bar at end of cell more quadrate. The black border is narrower than in *moerens* due to the increase in width of the discal bar ; marginal orange spots large Hind wing discal bar wider, especially at costa and more triangular in outline, the outer border slightly angled in 5–6 but obscured by the dark rufous at the inner edge of the black border which is narrower than in *moerens*. Marginal border and blue spots as in *moerens*. *Underside*. Very similar to *moerens* but the silver discal bar on hind wing not divided in the upper half, and with only a small brown spot at costa, the outer border strongly angled in 5–6 ; the postdiscal silver and blackish marks more distinct.

FEMALE. Fore wing length 45 mm. *Upperside*. Very similar to *stevensoni* in colour and pattern, thus unlike the female of *moerens*. There are three black marks in the fore wing cell, as in the male, but the sub-basal one is very small. Hind wing discal bar strongly angled on outer border, as in the male, on the underside, so also the distal dark band ; otherwise very similar to *stevensoni*.

Holotype male, NORTHERN TRANSVAAL, Zoutpansberg, Entabeni, 30.iii.1962, (*H. D. Brown*), in Transvaal Museum.

Allotype female : NORTHERN TRANSVAAL, Zoutpansberg, Entabeni, x.1950 (*F. Craib*), in Transvaal Museum.

Paratype male, Entabeni, ii.1962 (*L. Schroder*).

Range : Northern Transvaal, Zoutpansberg district, Entabeni.

Charaxes druceanus stevensoni **ssp. n.**

(Pl. 15, figs. 85, 86)

MALE. Length fore wing 40–42 mm. *Upperside*. General pattern comes very close to *cinadon* in general appearance, but the colour of the bases and the discal bars paler and brighter ; the discal bars wider, 10 mm. in 1b fore wing and 9 mm. at costa hind wing where the orange tends to be paler. The black distal border is narrower than in *cinadon*. From *proximans* it differs in being generally darker above and with narrower discal bars. *Underside*. Ground colour bright chestnut very similar to *cinadon*, but silvery discal bars wider and with the orange distad to the bar in fore wing wider and brighter. In the hind wing the postdiscal and submarginal silvery lines coalesce forming an irregular silvery band ending in the darker rounded spot at anal angle.

FEMALE. Although the general pattern of the upperside is similar to that of *cinadon* the differences in colour are marked : the basal areas are paler orange-chestnut, the discal bars are considerably wider, 11 mm. at hind margin in fore wing, 12 mm. at costa hind wing, more orange in both fore and hind wing ; the black proximad to the discal band and the black distal border are in contrast to the orange band. This female thus stands intermediate between *cinadon* and *proximans* in colour and pattern. On the underside the silvery bars are much more marked than

in *cinadon*, and, as in the male, the postdiscal and submarginal silvery-grey lines are completely merged into a broad silvery-grey band contrasting with the light admarginal orange border and black margin, and though the silvery spot in 2 is separate and small the anal double mark is well developed as it is above.

Holotype male. S. RHODESIA: Vumba Mts. (Eastern side of S. Rhodesia), 6.iv.1938 (*H. R. H. Stevenson*).

Allotype female. Same data; to be deposited in the British Museum (N.H.).

From the material at my disposal, ten males and seven females, it would appear that this distinct race is confined to the escarpment on the eastern boundary of Southern Rhodesia, in the Vumba Mountains and on the borders of the Manica district of Mozambique, thus separated from *proximans* by the wide Zambesi Valley. From data supplied the altitudinal range appears to be from 2,000–6,000 feet. There is some individual variation in the males but not extending beyond the general pattern of the race as defined above. Capt. Stevenson was the first to recognize this race, but for some reason he never published a description of it. I have pleasure in naming this subspecies after him.

Charaxes druceanus proximans Joicey & Talbot

(Pl. 15, figs. 87, 88)

Charaxes druceanus proximans Joicey & Talbot, 1922: 338.

In this race the sexes are less differentiated in colour than in any other. It has a very wide distribution, but not so extended as cited by Talbot, for it does not reach Uganda.

MALE. Fore wing length 40–41 mm. *Upperside.* General pattern as in races already described but modified as follows: ground colour at bases of fore and hind wing bright orange-chestnut, discal bands lighter orange and wide, 11–12 mm. in 1a–1b fore wing and 6 mm. at vein 4; hind wing bar at costa 10–11 mm. slightly whitish at first and remaining wide until it merges into the inner fold. Black spots in fore wing conspicuous against the light ground, the outer black border narrower as a result of the widened discal bands: admarginal orange chestnut spots and lunules large and very conspicuous on fore and hind wing; blue spots in hind wing black border at and above anal angle usually clear and conspicuous. (There is some slight individual variation in the width of the fore wing bar and in the depth of colour of the basal chestnut, but not associated with any geographical location.) *Underside.* As in the race *stevensoni* but the ground colour is a lighter brighter chestnut and the silvery bars and lines are wider.

FEMALE. As in the race *stevensoni* but the ground colour is a brighter chestnut and the discal bars less in contrast. Fore wing length 49–50 mm., general pattern as in the male but basal areas and bars paler, with the black spots of fore wing and black outer borders more in contrast as a result. Underside as in the male but silvery bars and lines wider, the light orange area distad to the silvery bar very noticeable and the black submarginal marks at and above the tornus stand out in contrast. In the hind wing the postdiscal wavy silvery lines tend to coalesce but not to the extent as in *stevensoni*.

Range: the full range of this race is given in the systematic list and I would emphasize that it does not extend to Uganda as stated in the original description. The association of a "Uganda" female with the race *proximans*, especially as it was made the type of this sex, gave rise to erroneous identification of Elgon-Mau

druceanus as *proximans* in my earlier *Charaxes* papers (van Someren & Rogers, 1928 : 3 ; 1939 : 179). The race there mentioned should be *septentrionalis* Lathy, which was described from Hoey's Bridge, Trans-Nzoia, and not Toro as stated in error by me. A specimen recorded by Carpenter (1945 : 83) as nominate *druceanus* Butler, from Morogoro, Tanganyika Territory, belongs to the race *proximans*.

Charaxes druceanus obscura Rebel

(Pl. 15, fig. 92. Pl. 16, figs. 93–100)

Charaxes druceanus obscura Rebel, 1914 : 253.
Charaxes kivuanus Jordan, 1925 : 288. **syn. n.**
Charaxes cryanae Le Cerf, 1932 : 406. **syn. n.**

The above three names have all been applied to examples of *druceanus* as found in the area of the Kivu Province, Ruanda-Urundi and SW. Uganda. Having made a critical examination of topotypical specimens and studied photographs of the types, I have no doubt that *kivuanus* (Pl. 16, figs. 97, 98) and *cryanae* (Pl. 16, figs. 95, 96) must be considered synonyms of *obscura* Rebel (Pl. 16, figs. 93, 94).

This is a small race characterized by its very dark colour and comparatively narrow discal bars.

MALE. Fore wing length 39–40 mm. *Upperside*. Basal areas of wings dark chestnut ; discal bands lighter chestnut, 7 mm. wide in 1a–1b, slightly less in 2, and only 3 mm. in 3 ; inner edge indented by the black basal spots in 2–4, outer edge rather diffuse as it merges into the black distal border ; admarginal light chestnut marks widely separated by black ends to the veins. Hind wing discal band light chestnut, slightly paler at the costa where it is 9 mm. wide but tapering rapidly in vein 4 where it merges into the dark chestnut inner fold, the outer edge darkening and merging into the black border which carries purply-blue spots, double at anal angle, and single in 2–4 ; admarginal border light chestnut slightly indented proximad by dark vein tips. Tails on veins 2 and 4 relatively short, 5–3 mm. long, lower one slightly curved outward. *Underside*. Pattern as in other races but in the fore wing the outer and upper discal spots from 4–7 very narrow ; ground colour at bases bright chestnut ; silvery bars and lines clearcut ; post-discal and submarginal wavy lines in hind wing usually separate, but may touch here and there. A single chestnut spot at costa in hind wing discal band ; the elongate black spot in 1b fore wing usually solidly black and large, forming a prominent feature at base of wing.

FEMALE. Fore wing length 45 mm. *Upperside*. Pattern and general colour very like the male, but basal areas slightly paler and the discal bars more orange, that of the hind wing paler at the costa, but not white, tapering rapidly and merging into the colour of the inner fold in area 3. In the only female specimen available to me a conspicuous feature is the series of mauvy-blue submarginal spots in the distal border, double at anal angle and singly up to 7. (This may also be found in some females of *septentrionalis*.) *Underside*. As in the male but all marks enlarged.

As the female of this race has not hitherto been described this specimen becomes the allotype.

Allotype, female. SW. UGANDA : Kigezi, Mafuga Forest, vi.1952 (*T. H. E. Jackson*), in British Museum (N.H.).

This race is comparatively common in the higher forests of the Kigezi Province of SW. Uganda, but as usual, males are more in evidence than females. Kigezi comes within the Kivu ecological area which extends from the Ruanda-Urundi area, Lake Kivu, to south west Uganda and eastern Ruwenzori. For this reason, and because

of general similarity, this race is determined as *obscura* Rebel, with *kivuanus* Jordan and *cryanae* Le Cerf placed as synonyms. It should be noted however that Kigezi examples have slightly wider fore wing discal bars, above and below, and that, though a long series from this locality is available, comparative material of *obscura*, *kivuanus* (topotypical) and *cryanae* is represented by half a dozen specimens only.

Charaxes druceanus septentrionalis Lathy

(Pl. 17, figs. 101, 102)

Charaxes druceanus septentrionalis Lathy, 1926 : 93. (Type ♂ in Coll. Madame Fournier, Paris.)

MALE. Fore wing length 40–42 mm. *Upperside*. General pattern as in other races. Ground colour brighter chestnut than in *obscura* ; black spots in fore wing smaller and less obvious ; discal bars paler and more orange, that of fore wing rather narrow, but slightly variable, 6 mm. wide in 1a–1b, slightly narrower in 2 ; that of hind wing only slightly paler at the costa where it is 5 mm. wide but tapering rapidly and merging into the chestnut of the inner fold at vein 3. Admarginal spots fore wing well separated by dark veins, but that of hind wing only slightly divided by the veins ; tails short as in *obscura*. *Underside*. Very similar to *obscura* but discal silvery bars slightly narrower.

FEMALE. Fore wing length 45–47 mm. *Upperside*. General colour very similar to female of *obscura*, but basal chestnut paler ; dark spots fore wing not so black, orange discal bars slightly paler and wider, with some individual variation but averaging 10 mm. in 1a–1b, 8 mm. in 2, 5 mm. in 3 ; outer edge of bar shaded with deeper chestnut and merging into black outer border and inner fold. Admarginal orange spots well separated in fore wing but hind wing lunules only narrowly divided. *Underside*. As in the male, but silvery bands and lines wider ; the silvery submarginal lines in hind wing irregular, often separated, sometimes coalescing.

Charaxes druceanus septentrionalis var. *alicea* Stoneham

(Pl. 18, figs. 109, 110)

Charaxes alicea Stoneham, 1931 : No. 5.

The original description is as follows :

" Fore wing above : the red-brown basal area is bordered distally by a black band, which is indented distally. The red median band is very narrow and covered with dusky scales. The black border is wide throughout its length.

" Hind wing, above : the red-brown basal area is restricted and the orange bar is absent, being represented by a small spot in cellule 8. Practically the whole of the hind wings are a beautiful glossy blue-black, with four light blue submarginal spots, and bordered by bright orange.

"Fore wing underside : the silver white median bar is absent, and the whole underside bears a dull appearance. There is a faint trace of a bar, dull silvery-grey in colour, extending from cellule 9 as far as cellule 4 only. The rest of this area is dark brown. The black spots in 1b, 2, and 3 are large and more or less kidney-shaped.

"Hind-wing underside : ground colour brown. There is a broad median band of dark chestnut narrowly bordered proximally by silvery-grey, and distally by a series of silver-grey streaks. The basal area is traversed by two narrow silver lines only, which, however, only extend to the cell, one near the base thereof the other through the middle. There is a fine and short silver-grey line in 1b."

Range : Kitale. The author states that he has seen other specimens.

Described as a species, *alicea* is undoubtedly only a variation of *septentrionalis* Lathy.

A specimen closely resembling the type of *alicea* was captured on the scarp above Broderick Falls, Trans-Nzoia in 1951. The general dark appearance suggests a degree of partial melanism. This is evidenced by the large increase in the size of the black marks on the inner border of the discal bar which is encroached upon even in 1b, reducing the bar in that area to 2 mm. so that the bar takes a distinct curve, for in 1a it is 5 mm. The distal border is very black on fore and hind wing and the discal bar in the latter, though pale and pinkish at the costa, extends only as far as the mid-cell. On the underside the silvery bars are limited to cell and just beyond in the fore wing ; in the hind wing to costa and base of cell. The ground colour is mainly reddish-chestnut with a slight paling in the line of the fore wing discal bar and the upper part of the hind wing bar ; on the other hand the black marks of the fore wing on either side of the discal bar are enlarged, those at tornus distinctly outlined with silver-grey. Pl. 18, fig. 113.

Charaxes druceanus septentrionalis var. ***lugari*** van Someren

(Pl. 17, figs. 105–108)

Charaxes druceanus septentrionalis var. *lugari* van Someren, 1939 : 179.

This variation is represented by a male and female reared from eggs laid by a female of the same type and by a male bred by C. Cripps, Soy, 1930. They represent a transitional variation between *alicea* and normal *septentrionalis*. In the male, the upperside is darkened throughout, obscuring the discal bands, whilst on the underside the silvery discal band of fore and hind wing is replaced by dull rufous. In the female, the fore wing upper side is darkened and the discal band obscured and reduced in width ; on the underside the normal silvery discal bars are replaced by dull rufous.

In my " Butterflies of Kenya and Uganda " (van Someren, 1935 : 178) I made the statement that *septentrionalis* Lathy came from Toro, Uganda ; this was incorrect, the type was described from Hoey's Bridge, Trans-Nzoia, Kenya.

A point of considerable interest is that in this race we find variations, more particularly on the underside, in which the characteristic silvery bars and lines are lost or become vestigial, as in var. *alicea* and var. *lugari*. I know of no such variations in other races of *druceanus* dealt with up to now, but the fact that it occurs not infrequently in *septentrionalis* suggests that it might also occur in other races and that the curious insect described from Cameroons by Jordan as *tectonis* is in fact such a variety. It is worthy of note that in the South Elgon–Trans-Nzoia area we find a similar variation in *Charaxes eudoxus*, named *amaurus* by Poulton. Here also, the characteristic silvery lines are entirely absent or vestigial. This variation occurs not only in the race *cabecus* of the Elgon-Mau area but also in *eudoxus katera* Carpenter of the Masaka District of Uganda and *eudoxus mechowi* of western Uganda and east Congo.

Charaxes druceanus teita van Someren

(Pl. 18, figs. 111, 112, 114–116)

Charaxes druceanus teita van Someren, 1939 : 177.

Since describing this race, a large number of topotypical examples have been captured or bred.

MALE. Fore wing length 43–45 mm., thus larger than either *obscura* Rebel or *septentrionalis* Lathy or more southern races. *Upperside.* General colour nearest to *obscura* but the basal chestnut areas with a distinct purply bloom, especially on the fore wing, giving them a darker tone. Fore wing discal bar slightly darker and wider, 9 mm. wide at 1a–1b, 7 mm. at 2, 5 mm. at 3. Hind wing bar conspicuously white at costa and also in space below, 8 mm. wide at costa then tapering rapidly to 4 where it merges into the chestnut of the inner fold and the black marginal border. The orange admarginal spots of fore wing well separated by black ends of veins; those of hind wing broader than in *obscura* and extending round the apex to the costa. Hind wing black border slightly wider than in *obscura*; tails longer and thinner with little difference between upper and lower, 7 mm. long. *Underside.* Chestnut areas slightly darker than *obscura*; silvery bars wider but with more distinct black centres. The first costal line in hind wing shorter than in 6, and corresponding to the white spot above, the inner margin of the hind wing silver band thus more curved.

FEMALE f. *teita.* The type of this race is a pale coloured example, probably slightly worn. Similar pale though fresh examples have since been taken but the commoner form is now described : f. *typica* **forma n.,** fore wing length 49–50 mm. *Upperside.* Pattern as in the male but the basal areas paler chestnut; the linear mark at base of 5 fore wing often pronounced; the discal bars much paler orange; that of hind wing with a conspicuous white area at the costa, as in the male. Admarginal orange border of hind wing turning greenish at anal angle; submarginal blue spots large and may extend to 4–5, large at 2 and diminishing in size toward 5, double at anal angle. *Underside.* As in the male but all marks larger; there is a marked tendency for the wavy silvery-grey submarginal lines in hind wing to form a series of ocellate spots similar to that at anal angle, but with chestnut centres. The tails are very long and thin as a rule, 12 mm. at 4 and 13 mm. at 2; they may be slightly shorter but always longer than in other races. This type of female with orange discal bars can be known as form *typica,* being commoner and more male-like than f. *teita.*

It will be noted that in the systematic list I have included within the range of this race specimens from Ngong, the Langata forest and the Karura Forest on the outskirts of Nairobi (Pl. 18, figs. 111 and 112). Such specimens conform more to the race *teita* than to *septentrionalis* of Elgon-Mau. On the upperside the males and females have the characteristic white spots of the hind wing band at the costa, but the underside is slightly different especially in regard to the non-confluence of the silver-grey submarginal lines of the hind wing. Specimens occur spasmodically in the Nairobi area where the food plant *Syzygium* is very rare. It is possible that both the insect and the food plant may be more plentiful on the higher ground of the southern Aberdares, east of the Rift Valley, but I have not found them there. I also tentatively include within the range, a specimen from Mt. Meru, Kilimanjaro (A. Rydon Coll.). The specimen is worn and more material is required before this can be placed with certainty.

Carpenter (1945) referred a female specimen taken on Dabida, Teita Hills to *kivuanus* Jordan. This specimen was described by Poulton, 1929 : 477 as the female of *kivuanus,* but it belongs undoubtedly to race *teita.*

Systematic List

Charaxes druceanus Butler

Ch. druceanus druceanus Butler, 1869. Type locality: "Old Calabar" South Nigeria. Range: Nigeria, Gabon; Guinea.

tectonis Jordan, 1937. Type locality: Msungli, Cameroon Mts.

cinadon Hewitson, 1870. Type locality: Natal, S. Africa. Range: Natal to south of Swaziland: Durban, Kloof, 1700 ft., Eshowe 1,700 ft., Zwartkop 4,700 ft., Karkloof 4,500 ft., Kranskop 3,600 ft., Balcomb's Hill 3,600 ft. All except Eshowe, south of Tugela River.

moerens Jordan, 1936. Type locality: Mariepskop, Drakensberg Range. Range: the mountain range mostly south of Olifants River: Graskop, Mariepskop 4,500–7,000 ft., but also north of Olifants Riv.: Wolkberg, Woodbush, Malta Forest and Haenertsburg.

entabeni ssp. n. Type locality: N. Transvaal, Zoutpansberg, Entabeni.

stevensoni ssp. n. Type locality: Vumba Mts. eastern border of Southern Rhodesia: Umtali, Melsetter, Mt. Selinda. ? Extending south to the Transvaal border ?

proximans Joicey & Talbot, 1922. Type locality: Mt. Mlanji, south Nyasaland. Range: NW. Southern Rhodesia, N. Rhodesia, Nyasaland, corner of eastern Angola, Katanga, southern and western Tanganyika Terr. Kungwe, but *not* to Uganda as stated in original description.

obscura Rebel, 1914. Type locality: NW. end Lake Tanganyika–Lake Kivu Prov. 1,900–2,100 metres (Grauer).

Synonyms: *kivuanus* Jordan, 1925. South-east Lake Kivu.
cryanae Le Cerf, 1932, South-west Lake Kivu. Range: North of Lake Tanganyika, Lake Kivu to SW. Uganda, north to east side Ruwenzori. (Uganda material slightly different.)

septentrionalis Lathy, 1926. Type locality: Hoey's Bridge, Trans-Nzoia.

var. *alicea* Stoneham 1931. Kitale, Trans-Nzoia.

var. *lugari* van Someren, 1939. Lugari, Trans-Nzoia.

Range: Elgon-Nyanza, Kitale, Trans-Nzoia, Mau, Ravine, Cherangani, Visoi, Tembach, Nandi, Broderick Falls, *west* of Rift Valley.

teita van Someren, 1939. Type locality: Teita Hills, Chawia Forest Bura Bluff. Range: Teita Hills, Wandanyi, Chawia, Wesu, Mbololo; extending to Nairobi forests, Langata and Karura in slightly different form; ? to Arusha Kilimanjaro. *East* of Rift Valley.

ACKNOWLEDGEMENTS

This revision has necessitated the bringing together of a very considerable quantity of topotypical material, and most important of all, the close examination of types where available, or photographs of them. The relevant material was brought together as a result of the willing co-operation of many museums and individuals without whose help this revision could not have been undertaken. I gratefully acknowledge my indebtedness to Mr. T. G. Howarth of the Entomological Department, British Museum (Natural History) for loan of material and photographs of types ; Mr. Ernest Taylor of the Hope Department of Entomology, Oxford, for making available the type series of *moerens* Jordan ; Dr. G. Bernardi, Paris Museum for photos of Le Cerf's types ; Dr. Hannemann of the Berlin Museum for access to west African material and a photograph of the type of *Ch. acuminatus* Thurau ; Dr. F. Kasy of Vienna Museum for photographs and specimens of Rebel's types ; Dr. C. B. Cottrell of University College, S. Rhodesia for material from Northern and Southern Rhodesia ; Mr. Elliot Pinhey, National Museum, Bulawayo : topotypical *proximans* from the Rodney Wood Collection and specimens from Vumba from the Stevenson Collection ; Dr. G. van Son, Transvaal Museum, Pretoria for material from Transvaal ; Messrs. B. D. Barnes and Harold Cookson of Umtali for S. Rhodesian material ; Messrs. K. M. Pennington and C. G. C. Dickson foı information and specimens of Natal *cinadon* ; Mr. J. Lawson of Durban Museum for specimens from the Kenway Collection ; Mr. Gowan Clark of Port Elizabeth for drawings of early stages ; Mr. R. H. Carcasson of the Coryndon Museum, Nairobi, for Rhodesian material; Mr. B. Barton Eckett for N. Rhodesian specimens ; Monsieur R. Roy of I.F.A.N., Dakar ; Dr. A. Rydon of Mombasa, Kenya ; and Mr. T. H. E. Jackson of Kitale for loan of specimens and help in drafting this paper.

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FIGS. 1 and 2, *jasius* L., ♂ and ♀, (Mediterranean). FIGS. 3 and 4, *epijasius* Reiche, ♂ and ♀, (Uganda). FIGS. 5 and 6, *epijasius* ab. *feisthameli* Le Cerf, Type, ♂, upper and underside (Guinea) (Photo Paris Museum).


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PLATE 2

Charaxes jasius L.

FIG. 7, *epijasius* ab. *murina* Le Cerf, Type ♂, (Guinea) (Photo Paris Museum). FIG. 8, *epijasius* f. *liberiae* Le Cerf, Type of *C. pelias* f. *liberiae* Le Cerf, ♂, (Guinea) (Photo Paris Museum). FIG. 9, *epijasius* var. *melas* var. n., Type ♂, (Uganda : Suk). FIGS. 11 and 12, *epijasius* var. *melas* var. n., ♂, upper and underside (Uganda : Mokia) (Photos B.M. (Nat. Hist.) Nos. 27026 and 27026A). FIG. 10, *epijasius* f. *harrisoni* Sharpe, Type of *Charaxes harrisoni* Sharpe, ♂, (S. Kavirondo) (Photo Hope Department, Oxford).

PLATE 2

PLATE 3

Charaxes jasius L.

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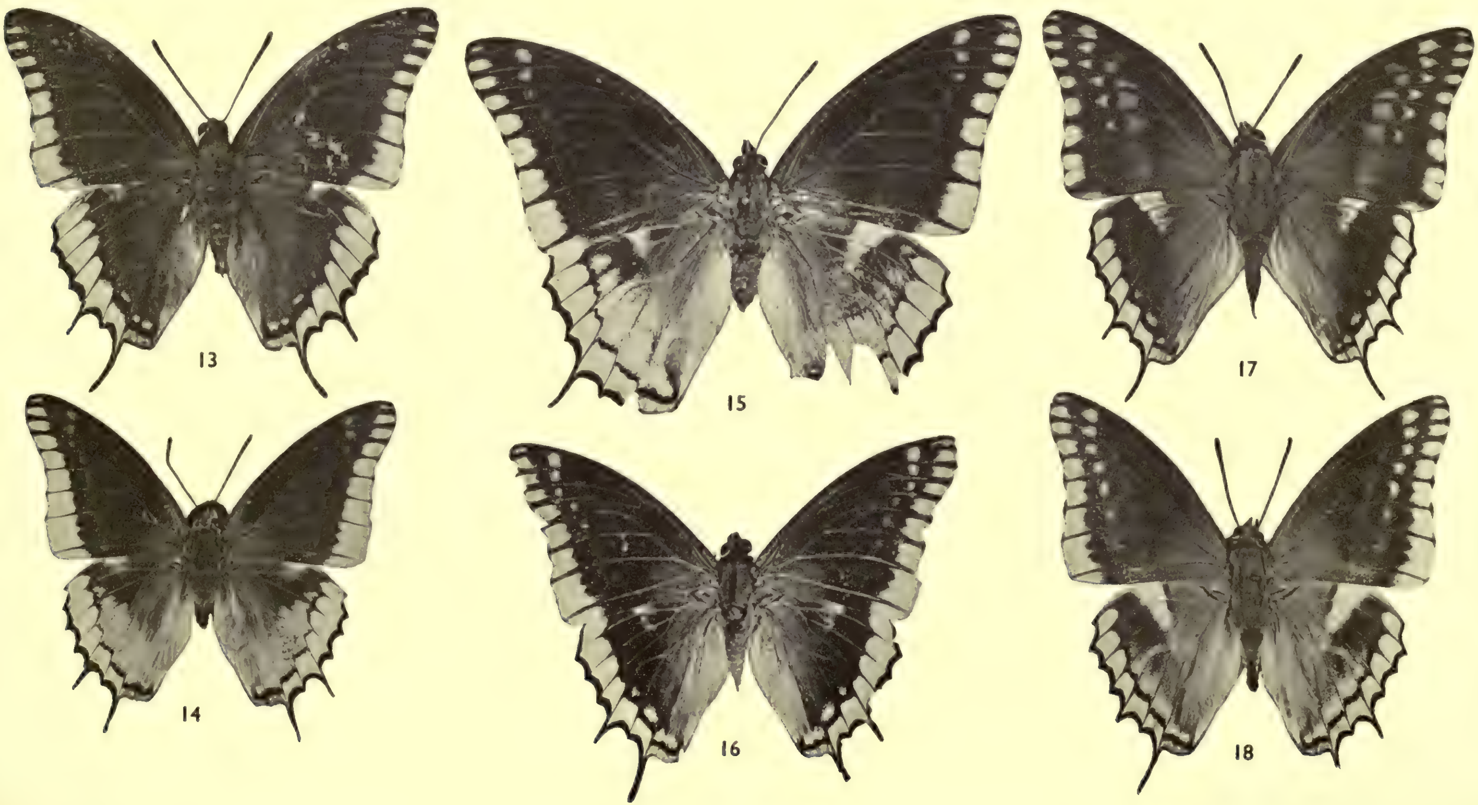
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PLATE 4

Charaxes jasius L.

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PLATE 5

Charaxes jasius L.

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PLATE 6

Charaxes jasius L.

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PLATE 7

Charaxes

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PLATE 8

Charaxes

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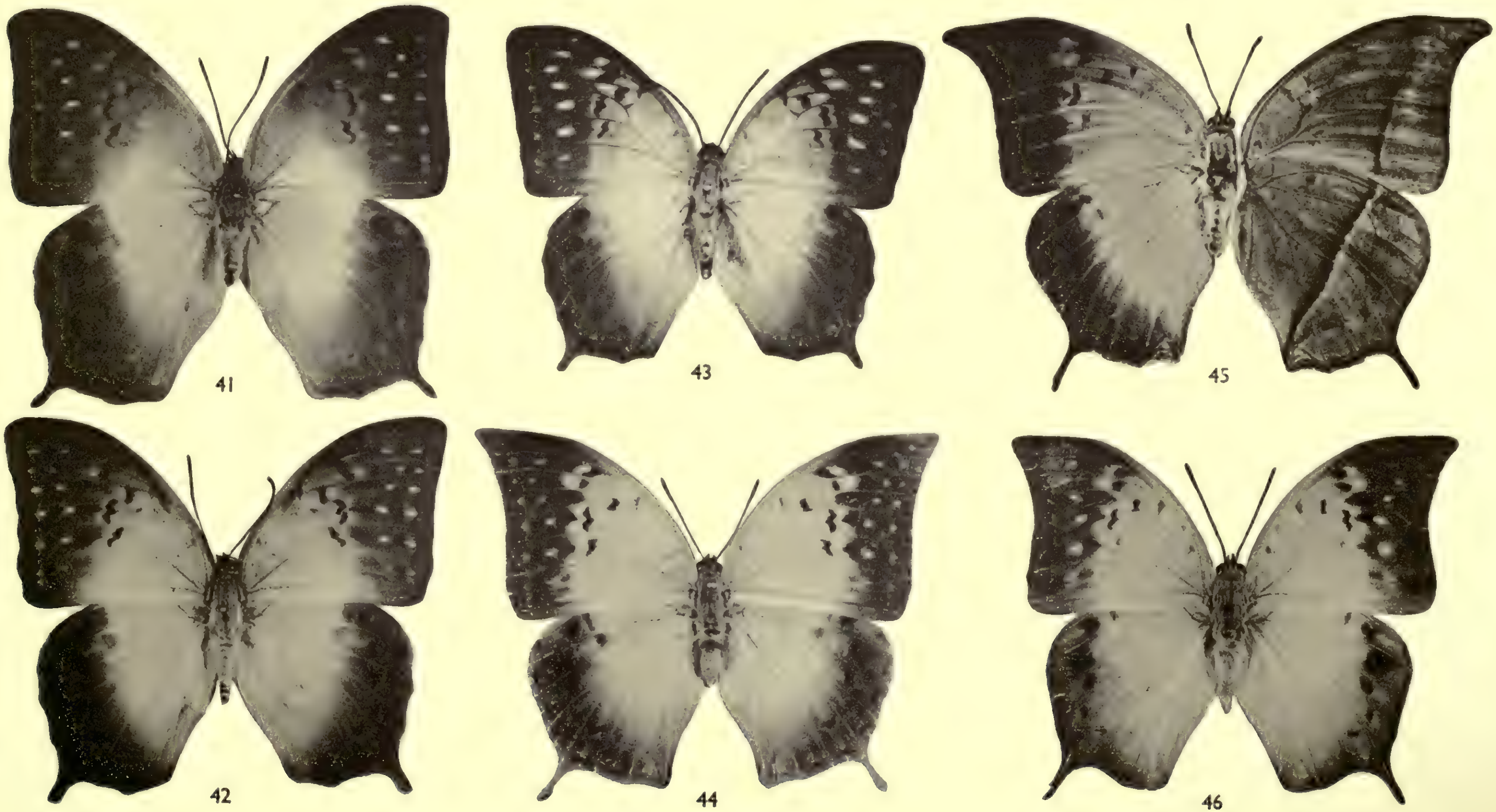
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PLATE 9

Charaxes acuminatus Thurau

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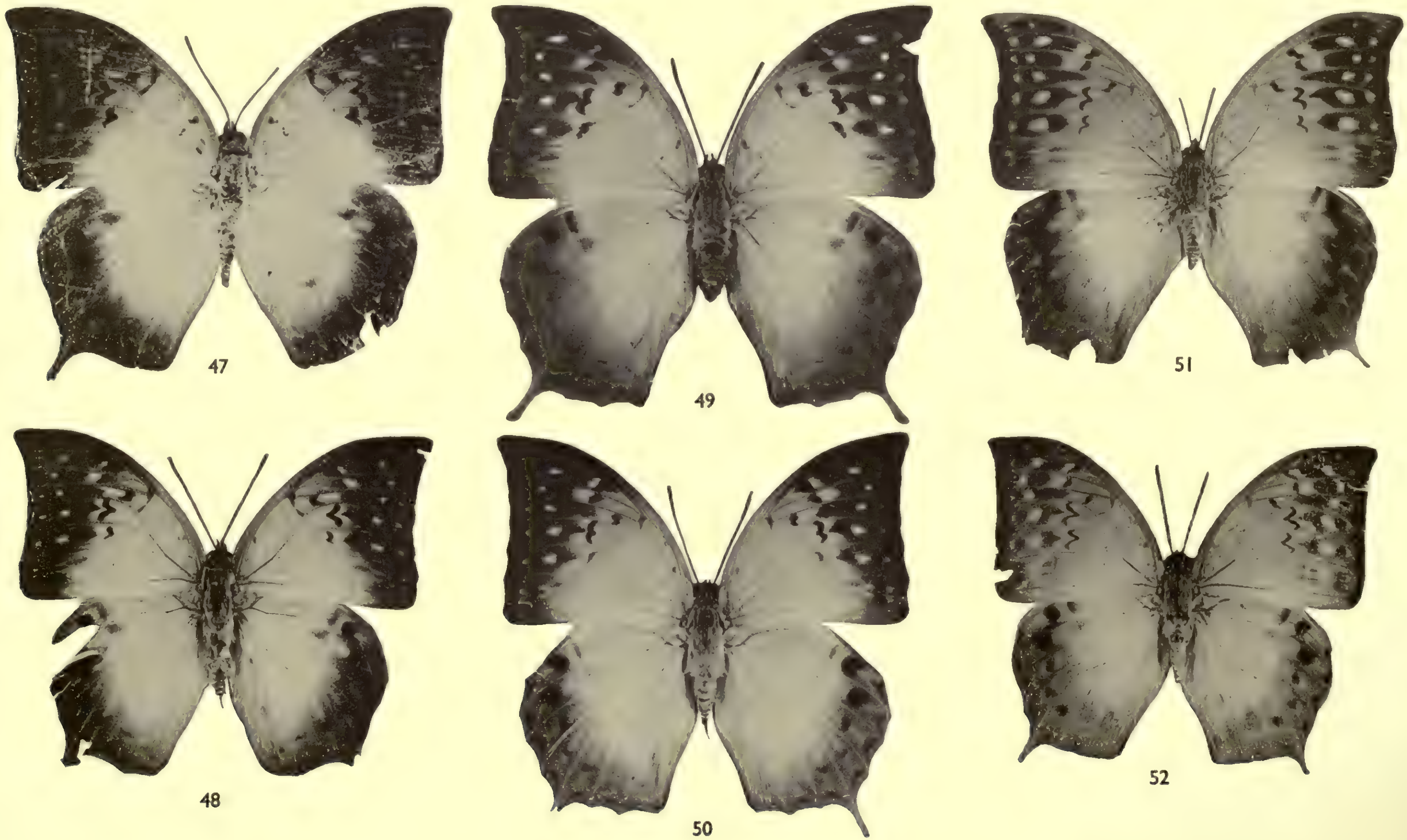
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PLATE 10

Charaxes acuminatus Thurau

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PLATE 11

Charaxes acuminatus Thurau

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PLATE 12

Charaxes

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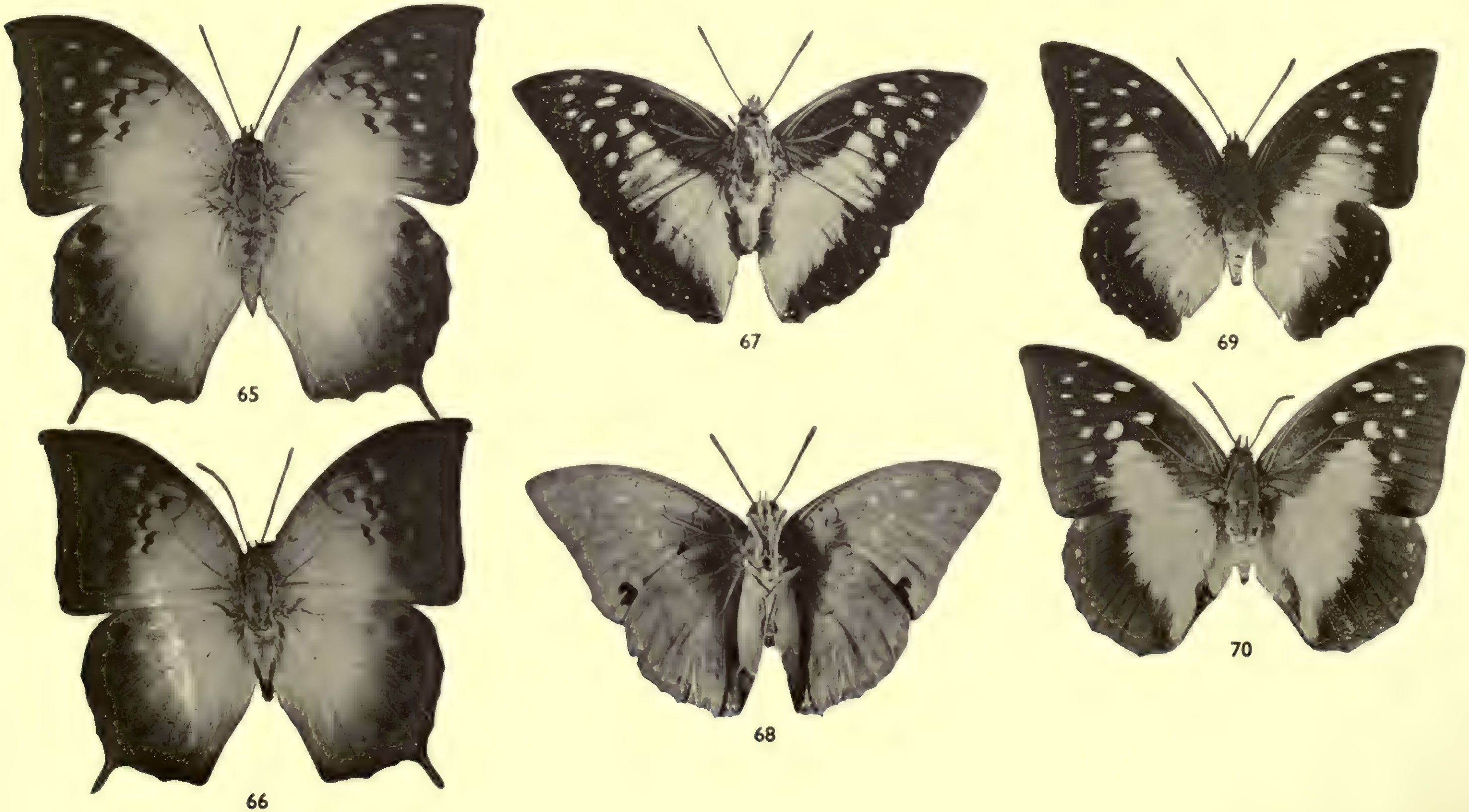
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PLATE 13

Charaxes pythodorus Hewitson

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PLATE 14

Charaxes druceanus Butler

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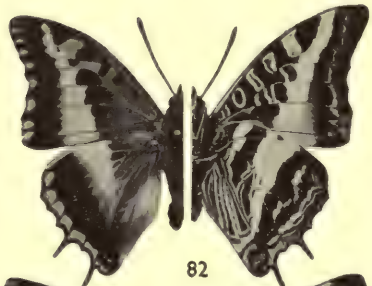

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Charaxes druceanus Butler

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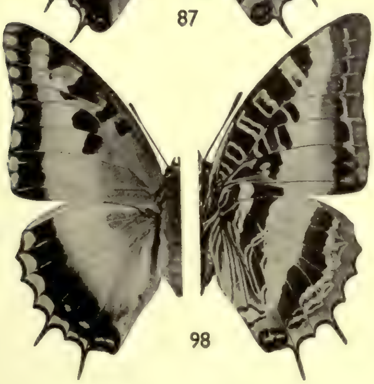

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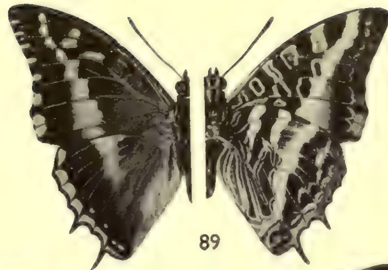

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PLATE 16

Charaxes druceanus Butler

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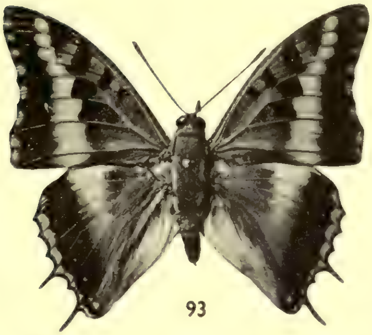

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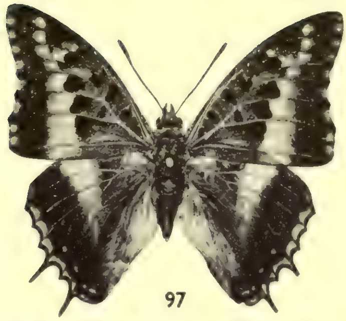

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PLATE 17

Charaxes druceanus Butler

FIGS. 101 and 102, *septentrionalis* Lathy, ♂ and ♀, (topotypical ,NW. Kenya), upper and under sides. FIGS. 103 and 104, *tectonis* Jordan, Type ♂, (Cameroons), upper and underside (Photos B.M (Nat. Hist.), Nos. 30041 and 30042.) FIGS. 105 and 106, *septentrionalis* var. *lugari* van Somere Type ♂, (Kenya), upper and underside (Photos B.M. (Nat. Hist.) Nos. 30460 and 30459). FIGS 107 and 108, *septentrionalis* var. *lugari* van Someren, Allotype ♀, (Kenya), upper and undersid (Photos B.M. (Nat. Hist.) Nos. 30458 and 30457).


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PLATE 18

Charaxes druceanus Butler

FIGS. 109 and 110, *septentrionalis* var. *alicea* Stoneham, Type ♂, (Kenya), upper and underside. FIGS. 111 and 112, near *teita* van Someren, ♂ and ♀, (Kenya, Ngong district). FIG. 113, *septentrionalis* Lathy var. ♂, (Kenya : Broderick Falls), upper and underside. FIGS. 114, 115 and 116, *teita* van Someren, ♂ and 2 ♀, (topotypical, S. Kenya), upper and undersides.

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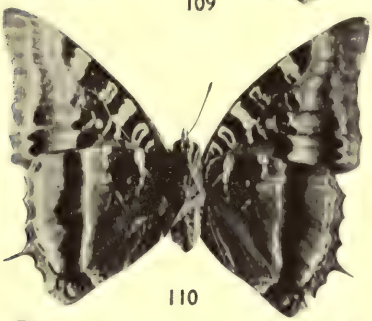

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PLATE 19

Charaxes druceanus entabeni ssp. n.

FIGS. 117 and 118, ♂, Paratype, upper and underside. FIGS. 119 and 120, ♂, Holotype, upper and underside. FIGS. 121 and 122, ♀, Allotype, upper and underside. (N. Transvaal, Zoutpansberg.)


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THE ACRIDOIDEA (ORTHOPTERA) OF MADAGASCAR
II. ACRIDIDAE, ACRIDINAE

V. M. DIRSH

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 13 No. 8
LONDON: 1963

THE ACRIDOIDEA (ORTHOPTERA) OF MADAGASCAR
II. ACRIDIDAE, ACRIDINAE

BY

V. M. DIRSH
Anti-Locust Research Centre, London

Pp. 243–286; 21 *Text-figures*

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THE ACRIDOIDEA (ORTHOPTERA) OF MADAGASCAR
II. ACRIDIDAE, ACRIDINAE

By V. M. DIRSH

SYNOPSIS

The subfamily Acridinae of the family Acrididae of Madagascar is revised. One new species is described. Inadequately described genera and species are redescribed and synonymy checked. Interrelation between genera and species are briefly discussed.

Subfamily **ACRIDINAE**

The majority of the family Acridinae are represented by common and widely distributed African genera and species and only a few of them may be regarded as endemic. The implications of this position will be discussed in the concluding zoogeographical part of the present work. However, it is of some interest to point out now that the subfamily Truxalinae, though distributed all over the world except Australia, is not found in Madagascar. Also the subfamilies Dericorythinae, Romaleinae, Lithidiinae, Tropidopolinae (represented in the Comoro Is.), Euryphyminae, Egnatiinae and Eremogryllinae have not so far been found in Madagascar. All these subfamilies are represented in Africa, some of them being confined only to the African continent.

As far as possible, all endemic genera and species of Madagascar are figured and internal sclerotized parts of the genitalia studied and figured as well. The latter character appears as being the most important for understanding the interrelation between genera and species.

In this part, as in Part I, the Acridoidea of Madagascar and the nearest coastal islands only are revised. Comoro and other more remote islands are not included.

Key to Genera

1 (12) Intercalary vein of medial area of elytron not serrated, or absent.
2 (11) Fastigial foveolae absent.
3 (8) Body strongly elongated, stick-like ; head elongated, narrow, acutely conical (Figs. 2, 3, 5).
4 (7) Prosternal process absent.
5 (6) Hind wing with speculum, transparent, colourless or slightly lemon-yellowish **_ACRIDA_** (p. 246)
6 (5) Hind wing without speculum, matt, brightly coloured in red, yellow and brown in apical and posterior parts . . . . . **_CHROMACRIDA_** (p. 250)
7 (4) Large, pyramidal prosternal process present . **_GELASTORHINUS_** (p. 253)
8 (3) Body moderately elongated, not stick-like ; head short or moderately elongated, conical or subconical.

9 (10) Fully winged. Antenna shorter than head and pronotum together. Comparatively large . . . . ***DURONIA*** (p. 255)

10 (9) Micropterous. Antenna longer, in male much longer, than head and pronotum together. Comparatively small (Fig. 6) . . ***PARALOBOPOMA*** (p. 256)

11 (2) Lower fastigial foveolae present (Fig. 7) . . ***GYMNOBOTHRUS*** (p. 258),

12 (1) Intercalary vein of medial area of elytron strong, serrated (in female sometimes not serrated).

13 (30) Antenna filiform, sometimes thickened in apical part. Head globular, subglobular or subconical; frons, in profile, straight or excurved.

14 (15) Hind tibia in apical part expanded. Fastigial foveolae absent. ***PARACINEMA*** (p. 262)

15 (14) Hind tibia in apical part not expanded. Fastigial foveolae present or absent.

16 (17) Fastigial foveolae elongated, twice or more as long as their width, trapezoidal (Fig. 11) . . . . ***AIOLOPUS*** (p. 264)

17 (16) Fastigial foveolae, if present, short, as long as or slightly longer than their width, or irregular form.

18 (19) Anterior and lower margins of lateral lobe of pronotum form attenuate and protruding angle . . . . ***PTERNOSCIRTUS*** (p. 267)

19 (18) Lower anterior angle of lateral lobe of pronotum rounded or obtusangular, but not attenuate and not protruding.

20 (21) Prozona of pronotum with two large, tooth-like projections (Fig. 12) ***TRILOPHIDIA*** (p. 269)

21 (20) Prozona of pronotum without projections.

22 (29) Head above subglobular, smooth. Mesosternal interspace less than twice as wide as its length.

23 (24) Median carina of pronotum deeply excised by basal transverse sulcus. Lower external area of hind femur slightly expanded (Fig. 13) ***PYCNOCRANIA*** (p. 270)

24 (23) Median carina of pronotum crossed but not excised by transverse sulcus. Lower external area of hind femur not expanded.

25 (26) Posterior margin of pronotum elongated, acutangular; dorsum crest-shaped ***GASTRIMARGUS*** (p. 271)

26 (25) Posterior margin of pronotum angular or rounded; dorsum tectiform or slightly saddle-shaped.

27 (28) Of medium size. Pronotum mostly with white X-shaped pattern. Hind wing with infumate transverse fascia (Fig. 16) . . . . . ***OEDALEUS*** (p. 274)

28 (27) Large. Pronotum without X-shaped pattern. Hind wing without fascia (Fig. 17) . . . . ***LOCUSTA*** (p. 277)

29 (22) Head subconical, rugose. Mesosternal interspace more than twice as wide as its length (Fig. 18) . . . . ***ACROTYLUS*** (p. 278)

30 (13) Antenna compressed and slightly widened. Head conical; frons, in profile, slightly incurved (Fig. 19) . . . . . . ***CALEPHORUS*** (p. 281)

ACRIDA Linnaeus, 1758

Large, with strongly elongated, almost stick-like body. Antenna ensiform, as long as or slightly shorter than head and pronotum together. Head strongly elongated, acutely conical; fastigium of vertex strongly elongated, with parabolic or obtusangular apex; fastigial foveolae absent; frons strongly or slightly incurved; frontal ridge low, narrow, strongly compressed at apex, shallowly sulcate on whole length, with obtuse lateral carinulae. Dorsum of pronotum elongated, flat or weakly tectiform, with sharp carinae; lateral carinae straight or slightly incurved, or slightly excurved, or divergent in metazona; dorsum crossed by posterior sulcus only; metazona as long as or slightly shorter, or slightly longer than prozona, its posterior margin obtuse or acutangular; mesosternal interspace open. Elytra and wings fully developed with acute apex; elytra with dense reticulation; intercalary vein of medial area present;

costal and sometimes subcostal veins finely serrated ; medial area of wing widened, lustrous, forming speculum. Hind femur strongly elongated and strongly narrowed ; lobes of hind knee with acute apices, upper internal lobe slightly longer than external one. Arolium large. Male supra-anal plate elongate angular. Cercus narrow conical, with obtuse apex. Subgenital

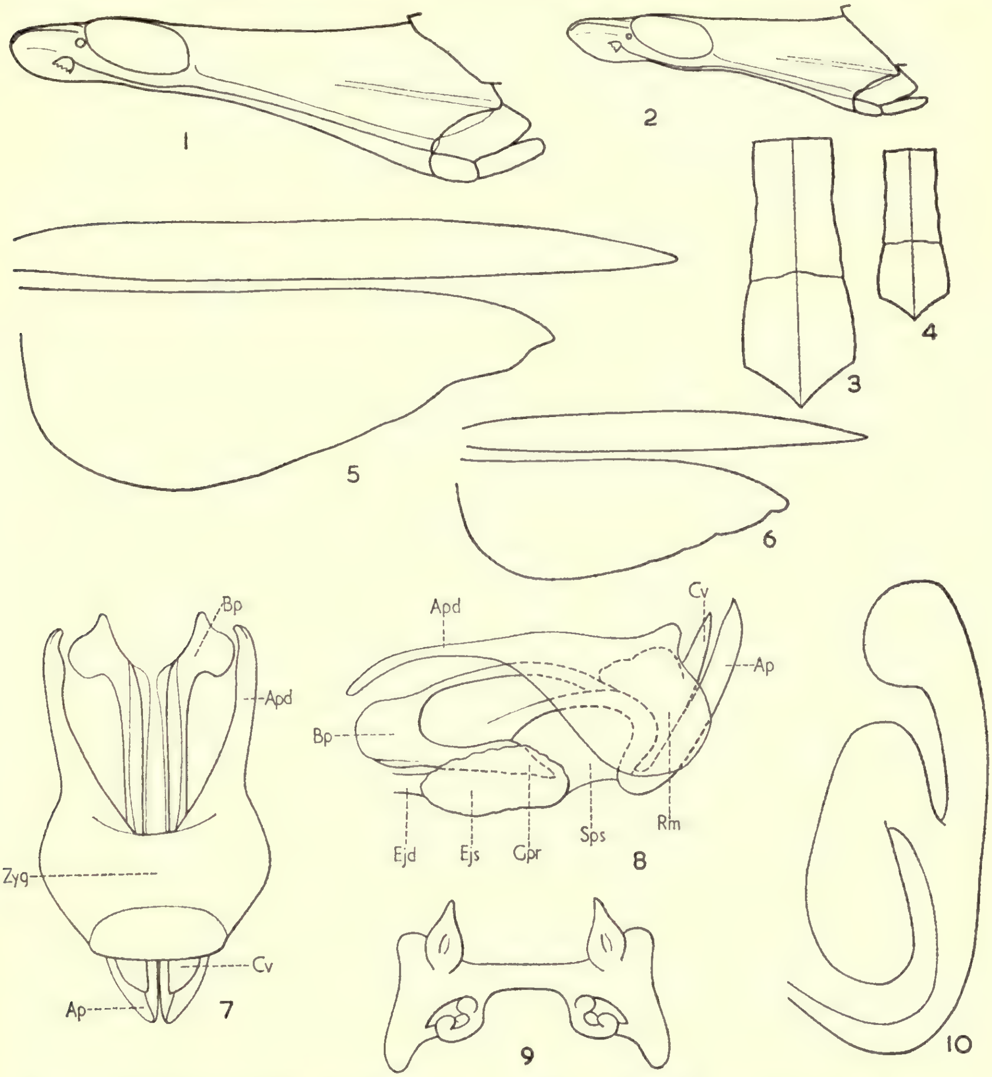

FIG. 1. *Acrida madecassa* (Brancsik, 1893). 1, head of female. 2, the same, male. 3, dorsum of pronotum, female. 4, the same, male. 5, elytron and wing, female. 6, the same, male. 7, phallic complex from above, ectophallic membrane and epiphallus removed. 8, the same, lateral view. 9, epiphallus. 10, spermatheca.

Ap, apical valve of penis. Apd, apodemus of cingulum. Bp, basal valve of penis. Cv, valve of cingulum. Ejd, ejaculatory duct. Ejs, ejaculatory sac. Gpr, gonopore process. Rm, ramus of cingulum. Sps, spermatophore sac. Zyg, zygoma of cingulum (the same lettering in all figures).

plate elongate, acutely conical or short acutely conical, with upper projection. Ovipositor short, robust, with curved valves.

Type species : *Gryllus Acrida turritus* Linnaeus, 1758.

Key to Species

1 (2) Transverse sulcus about the middle of pronotum ; lateral carinae undulated in prozona ; posterior margin of metazona obtusangular. Apex of elytron elongated, acute . . . . ***madecassa*** (Brancs.)

2 (1) Transverse sulcus before the middle of pronotum ; lateral carinae in prozona incurved, in metazona strongly excurved ; posterior margin of metazona elongated, acutangular, with pointed apex. Apex of elytron not elongated, comparatively obtuse . . . . ***subtilis*** Burr

Acrida madecassa (Brancsik, 1893)

(Text-figs. 1, 9)

Tryxalis madecassa Brancsik, 1893 : 186.
Acrida madecassa (Brancsik, 1893) ; Kirby, 1902 : 64.

♂. Large and slender. Head strongly elongated, slender, relatively narrow in basal part ; frons, in profile, slightly incurved ; fastigium of vertex long, with parallel lateral margins and rounded apex. Lateral carinae of pronotum in prozona undulated, in metazona slightly excurved ; transverse slucus crosses about middle of dorsum ; posterior margin of metazona obtusangular, with incurved sides. Elytra well produced beyond hind knee, narrow, with elongated, acute apex. Lateral lobes of hind knee short, acute ; upper lobe wider than lower one. Subgenital plate with elongated, acute apex.

Phallic complex : zygoma large and moderately sclerotized, apodemus long ; valve of cingulum short, subacute at apex ; basal valve of penis with lateral projection ; apical valve moderately narrow, longer than valve of cingulum ; flexure comparatively thick. Epiphallus with articulated ancorae and bilobate lophi, lobes short, rounded.

General colouration from green to brownish ; elytra uniformly green or with pattern, mostly brownish at apex ; hind wing slightly yellowish, sometimes slightly infumate.

♀. As the male but larger. Lateral carinae of pronotum in prozona more strongly undulated. Spermatheca with apical diverticulum widened at apex, preapical one downcurved, sac-like.

Length of body ♂ 38·0–43·0, ♀ 60·0–74·0 ; pronotum ♂ 6·0–7·0, ♀ 9·5–12·0 ; elytron ♂ 32·0–36·0, ♀ 49·0–63·0 ; hind femur ♂ 24·0–27·0, ♀ 34·5–41·0 mm.

Madagascar Ouest : Ampijoroa, Tsaramandroso, 1 ♀. Dct. Miandrivazo, iii.1960, 1 ♀ (*Gruchet*).

Madagascar Centre : Tananarive, Tsimbazaza, xii.1934, 1 ♂ ; 21.i.1948, 1 ♀ ; 20.iv.1948, 1 ♀ ; i.1960, 1 ♂, 1 ♀. Arivonimamo, 10.x.1948, 1 ♀. Manankazo Station Forestière, km 130, Route Majunga, 6.ii.1948, 1 ♀ (*P. Cachan*).

Madagascar Est : Ile Sainte-Marie, Ambohidena, v.1959, 2 ♀ (*E. Razafimandimby*). Pce. de Tamatave, Ambodiatafana, vi.1958, 1 ♀ (*Randimby*).

Madagascar Sud : Anakao, 8.iv.1953, 1 ♀. Itampolo, v.1951, 1 ♀. Manadrotsy, Betroka, 1 ♀ (*J. Elie*).

Acrida subtilis Burr, 1902

(Text-figs. 2, 9)

♂. Of medium size and relatively robust. Head moderately elongated, relatively wide in basal part ; frons, in profile, moderately incurved ; fastigium of vertex long, narrow, with broadly rounded apex. Lateral carinae of pronotum, in prozona incurved, in metazona strongly excurved

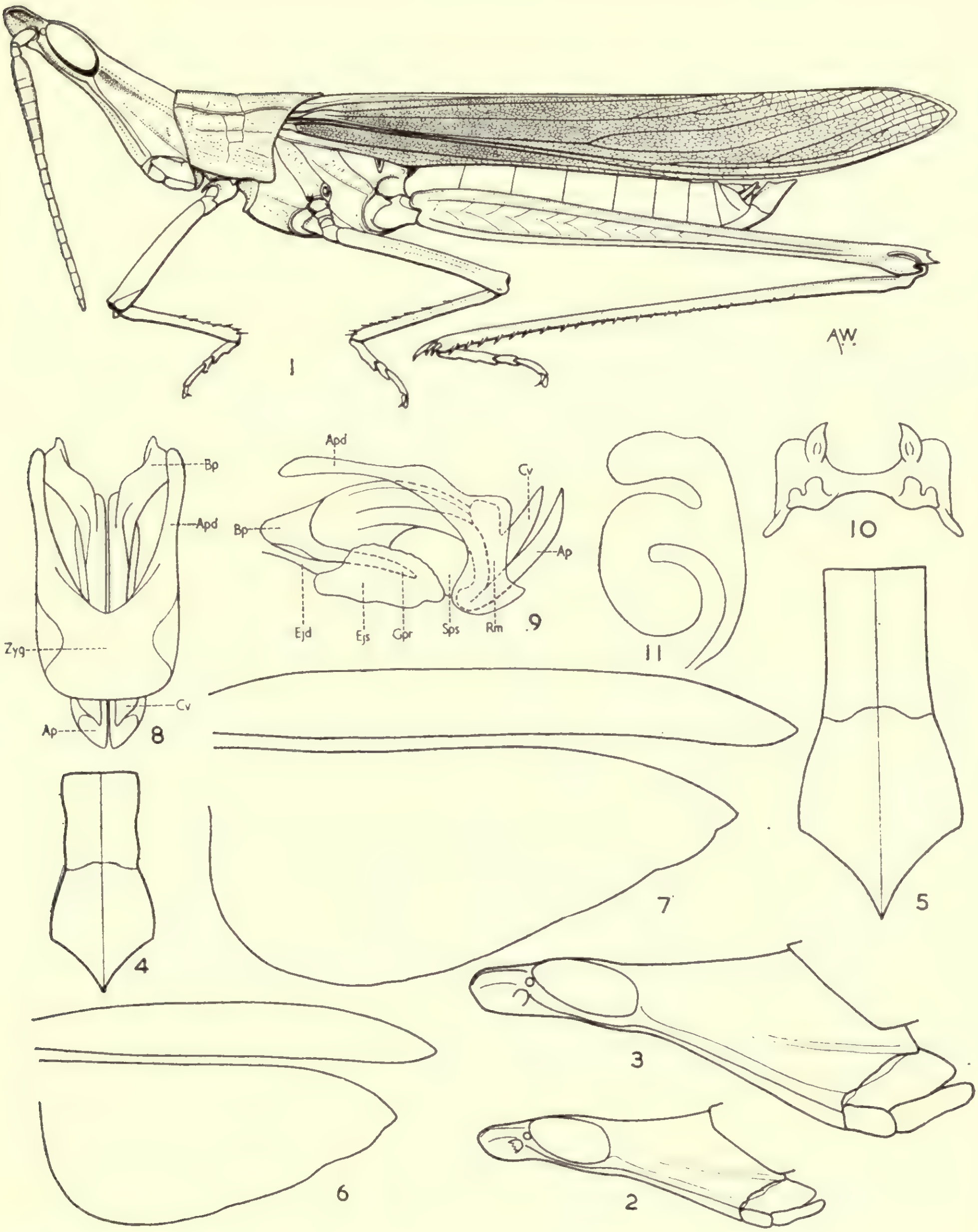

FIG. 2. *Acrida subtilis* Burr, 1902. 1, male. 2, head of male. 3, the same, female. 4, dorsum of pronotum, male. 5, the same, female. 6, elytron and wing, male. 7, the same, female. 8, phallic complex from above, ectophallic membrane and epiphallus removed. 9, the same, lateral view. 10, epiphallus. 11, spermatheca.

and divergent ; transverse sulcus before middle of pronotum ; posterior margin of metazona elongated, acutangular, with pointed apex and incurved sides. Elytron slightly produced beyond hind knee, wide, with short, wide apical part and comparatively obtuse apex. Lateral lobes of hind knee moderately long, acute, upper lobe being slightly wider than lower one. Subgenital plate moderately long, with subacute apex.

Phallic complex : zygoma of cingulum large, elongated ; apodemus long ; valve of cingulum short, with acute apex ; basal valve of penis with lateral expansion ; apical valve of penis narrow, slightly longer than valve of cingulum ; flexure rather thick. Epiphallus with articulated ancorae and bilobate lophi, with closely placed lobes.

General colouration green. Elytra green, sometimes with brownish pattern ; hind wing slightly yellowish, sometimes slightly infumate.

♀. As the male, but larger. Head relatively more widened in basal part. Spermatheca with moderately large apical and large, downcurved, sac-like preapical diverticula.

Length of body ♂ 30·0–36·0, ♀ 50·0–54·0 ; pronotum ♂ 5·0–6·0, ♀ 10·0–10·5 ; elytron ♂ 25·5–28·5, ♀ 39·4–41·0 ; hind femur ♂ 19·0–20·0, ♀ 28·0–30·5 mm.

Madagascar Centre : Ankazobe, Forêt Ambohitantely, 2.ii.1948, 1 ♀ (*R. Paulian*).
Madagascar Est : Ambalavao, i.1934, 2 ♂ (*R. Paulian*).
Madagascar Sud-Ouest : Sakaraha, Lambomakandro, iii.1956, 1 ♀ (*R. Paulian*).
Madagascar Sud : Monandrotsy, Betroka, 1 ♀ (*J. Elie*).

CHROMACRIDA Dirsh, 1952

Large, strongly elongated ; ratio of length to maximal width of body 10·1–12·2. Antenna narrow ensiform, longer than head and pronotum together. Head strongly elongated, narrow conical ; fastigium of vertex strongly elongated, large, spathulate ; fastigial foveolae absent ; frons, in profile, slightly incurved ; frontal ridge low, narrow, at apex compressed, shallowly sulcate on whole length, with obtuse lateral carinulae. Pronotum elongated, dorsum flat, median and lateral carinae sharp, linear ; posterior transverse sulcus crossing dorsum beyond middle. Mesosternal interspace elongated, its lateral margins incurved, anterior part widened. Elytra long, narrow, with strongly acute apex, reticulation dense ; intercalary vein of medial area present ; costal and subcostal veins scarcely serrated. Hind wing shorter than elytron, narrow, without speculum ; membrane matt, apical and posterior parts brightly coloured. Hind femur strongly elongated and very narrow, ratio of length to width 18–19. Upper lobes of hind knee of equal length, short. Arolium large. Male supra-anal plate elongate angular. Cercus short, narrow conical. Subgenital plate short conical, with acute apex. Ovipositor short, robust. Valves wide, slightly curved.

Type species : *Acrida radamae* Saussure, 1899.

Key to Species

1 (2) Large and less slender. Frons, in profile, more concave. Lateral carinae of pronotum in prozona straight and divergent ; posterior margin of metazona pointed. Hind wing twice as long as its width (Fig. 3) . ***radamae*** (Saussure)

2 (1) Smaller and more slender. Frons, in profile, less concave. Lateral carinae of pronotum in prozona undulated and parallel ; posterior margin of metazona acutangular, but not pointed. Hind wing three times as long as its width. (Fig. 4) . . . . ***brunneriana*** (I. Bolivar)

Chromacrida radamae (Saussure, 1899)

(Text-figs. 3, 9)

Acrida radamae Saussure, 1899 : 629.
Chromacrida radamae (Saussure, 1899) ; Dirsh, 1952 : 135.

♂. Slender. Antenna narrow ensiform, longer than head and pronotum together. Head strongly elongated ; frons, in profile, strongly concave ; fastigium of vertex with parallel sides and widely rounded apex. Lateral carinae of pronotum in prozona straight and divergent, in metazona divergent and excurved ; posterior margin of metazona acutangular, with pointed apex. Elytron long and narrow, ratio of length to width 12·1, at apex acute. Hind wing shorter

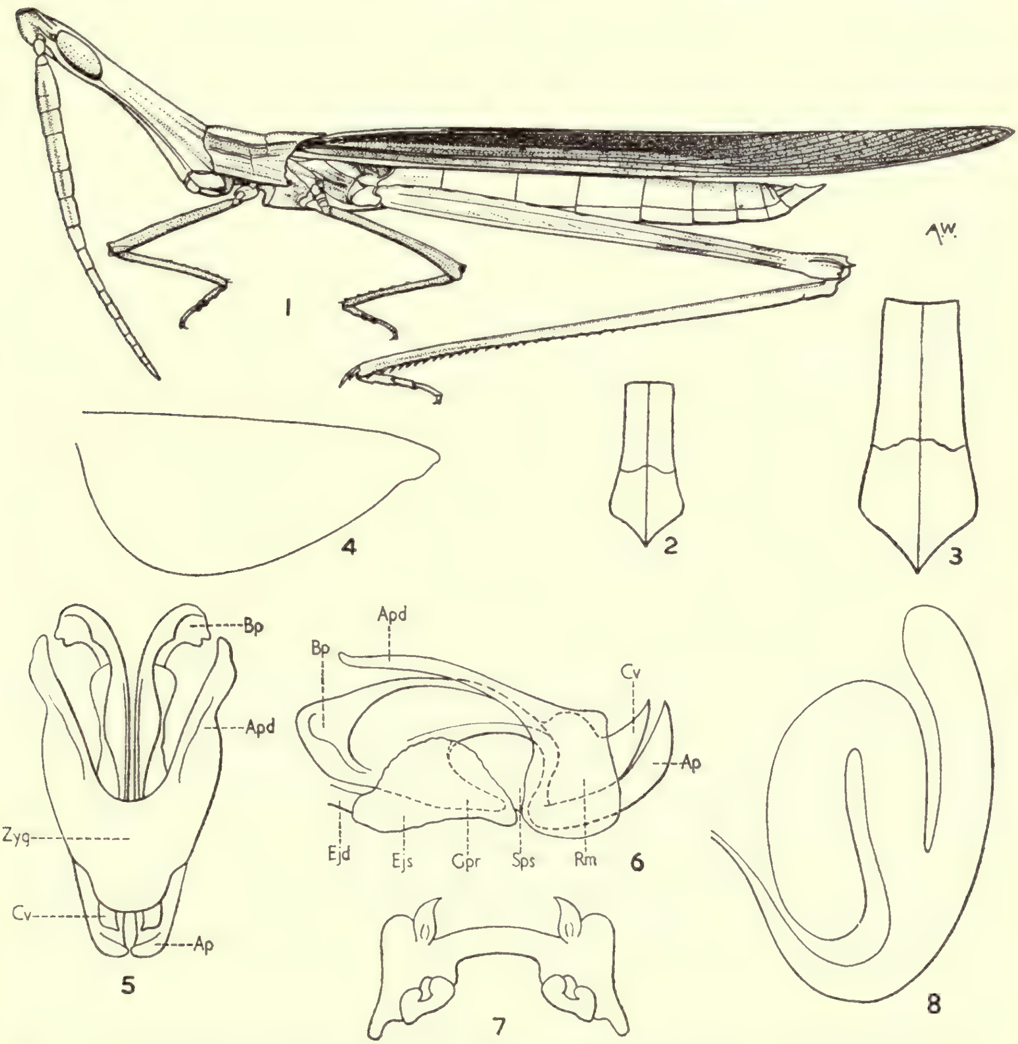

FIG. 3. *Chromacrida radamae* (Saussure, 1899). 1, male. 2, dorsum of pronotum, male. 3, the same, female. 4, hind wing. 5, phallic complex from above, ectophallic membrane and epiphallus removed. 6, the same, lateral view. 7, epiphallus. 8, spermatheca.

than elytron, wide, ratio of length to width about 2·1. Hind femur well produced beyond end of abdomen.

Phallic complex : zygoma of cingulum elongated, large ; apodemus comparatively short and wide ; valve of cinculum short, wide with acute apex ; basal valve of penis excurved at proximal end ; apical valve of penis robust ; upcurved, with acute apex ; flexure thin. Epiphallus with articulated ancorae and deeply bilobate lophi.

General colouration dirty-yellowish, sometimes greenish ; hind wing on external margin blackish-brown, gradually turning to flame-red ; basal part creamy-yellowish.

♀. As the male, but larger. Spermatheca with large, narrow apical and large, downcurved, sac-like preapical diverticula.

Length of body ♂ 44·0–45·0, ♀ 60·0–71·0 ; pronotum ♂ 6·3, ♀ 9·3–10·4 ; elytron ♂ 39·5–40·0, ♀ 56·0–61·0 ; hind femur ♂ 27·0–28·0, ♀ 32·5–41·0 mm.

Madagascar Ouest : Morondava, forêt sud de Befasy, i.1956, 1 ♂, 3 ♀ (*R. Paulian*).
Madagascar Centre : P. K. 132, Rte de Majunga, ix.1957, 1 ♀ (*J. Elie*).
Madagascar Est : Manakara, xi.1957, 1 ♀ (*J. Elie*). Ivohibe, Tarafangana, 1 ♀. Ranomafana, Ifanadiana, 1 ♀.
Madagascar Sud-Ouest : Tulear-Sakaraha, Zombitsy, 630 m. xii.1959, 1 ♂ (*E. Raharizonina*). Lambonakandro, 550 m. Sakaraha, 4–7.ii.1958, 2 ♀ (*P. Griveaud*). Tulear, iii–iv.1953, 1 ♂, 1 ♀ (*A. Robinson*).
Madagascar Est : Réserve nat. Ambatovositra, Andranomalaza, xii.1956 (*P. Soga*).
Madagascar Sud : Cap. Sainte Marie, xii.1951, 1 ♀ (*R. Paulian*). Fort Dauphin, iv.1953, 1 ♂ (*R. Paulian*).

Chromacrida brunneriana (I. Bolivar, 1893)

(Text-figs. 4, 9)

Tryxalis brunneriana I. Bolivar, 1893 : 161.
Acrida radamae (♂) Saussure, 1899 : 629 ; Dirsh, 1952 : 136.
Acrida sanguinea Saussure, 1899 : 629 ; Dirsh, 1952 : 136.
Acrida intercalata Burr, 1902 : 162 ; Dirsh, 1952 : 136.

♂. Very slender. Antenna narrow ensiform, longer than head and pronotum together. Head strongly elongated, narrow ; frons, in profile, moderately concave ; fastigium of vertex slightly widened towards apex, which is rounded. Lateral carinae of pronotum in prozona undulated, parallel ; in metazona slightly excurved ; posterior margin of metazona acutangular, but not pointed. Elytron long and narrow, ratio of length to width 13·5, with pointed apex. Hind wing considerably shorter than elytron, narrow, ratio of length to width about 3·1. Hind femur produced far beyond end of abdomen.

Phallic complex : zygoma of cingulum large, elongated ; apodemus comparatively long and narrow ; valve of cingulum short, narrow, with acute apex ; basal valves of penis moderately excurved at proximal end ; apical valve of penis widening towards distal end, apex, in profile, acute ; flexure comparatively thick. Epiphallus with articulated ancorae and shallowly bilobate lophi.

General colouration yellowish-brown ; external margin of hind wing blackish-brown, anterior part of wing, apical lobe and basal part crimson red, gradually turning creamy-pale towards base.

♀. As the male, but larger. Spermatheca with long, apical diverticulum curved at apex and moderately large, downcurved, sac-like preapical diverticulum.

Length of body ♂ 32·0–33·5, ♀ 47·0–53·0 ; pronotum ♂ 4·5–5·0, ♀ 7·0–8·0 ; elytron ♂ 28·0–30·0, ♀ 50·0–51·0 ; hind femur ♂ 19·0–21·5, ♀ 30·5–33 mm.

The newly moulted specimens of this species possess milky-white hind wings, which attain their full colouration gradually during sexual maturation.

Madagascar Centre : Ankazobe, Forêt d'Ambohitantely, 21.xii.1948, 1 ♀ (*R. Paulian*).

Madagascar Est : Ankadimanga, Manjakandriana, xii.1957, 1 ♀ (*J. Elie*). Moramanga, 1 ♀ (*P. Griveaud*).

Madagascar Sud : Fort Dauphin, iii.1960, 1 ♀ (*Randriamasy*).

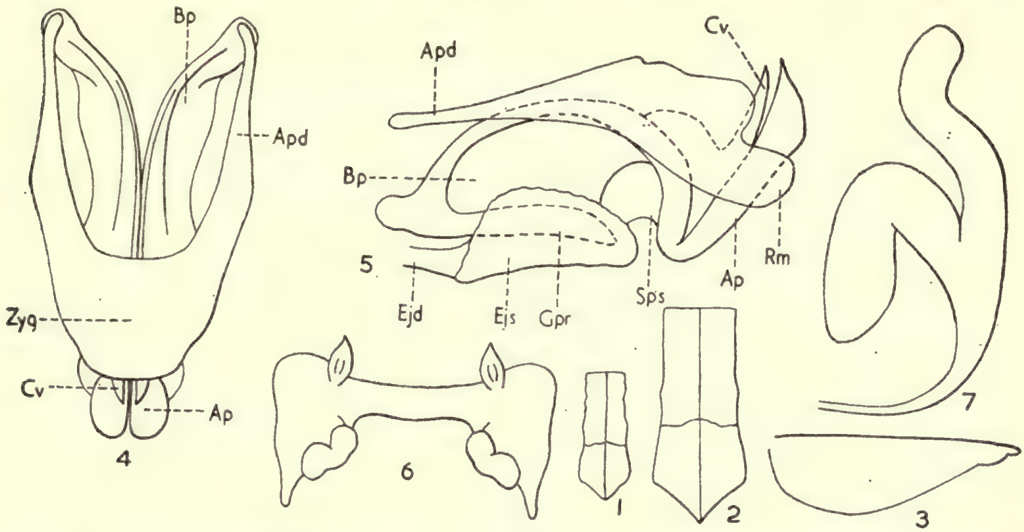

FIG. 4. *Chromacrida brunneriana* (I. Bolivar, 1893). 1, dorsum of pronotum, male. 2, the same, female. 3, hind wing. 4, phallic complex from above, ectophallic membrane and epiphallus removed. 5, the same, lateral view. 6, epiphallus. 7, spermatheca.

GELASTORHINUS Brunner, 1893

Of medium size, strongly elongated. Integument smooth. Antenna ensiform, longer than head and pronotum together. Head elongated, conical ; fastigium of vertex shorter than longest diameter of eye, with parabolic or widely obtusangular apex ; fastigial foveolae absent ; frons straight ; frontal ridge narrow, deeply sulcate with sharp lateral carinulae, gradually diverging downwards. Pronotum elongated, dorsum flat or slightly tectiform, medium and lateral carinae well developed, lateral slightly divergent in metazona ; only posterior sulcus crossing dorsum ; metazona much shorter than prozona, its posterior margin rounded or obtusangular. Prosternal process acutely conical or pyramidal, short with broad basal part. Mesosternal interspace open, narrow. Elytra and wing fully developed, narrow, venation and reticulation of elytra sparse, membrane transparent ; intercalary vein of medial area present. Hind femur narrow ; internal upper lobe of hind knee longer than external one, with angular apex ; lower lobes of equal length. Arolium large. Male supra-anal plate elongate angular, with acute apex. Cercus slightly compressed, with obtuse and slightly incurved apex. Subgenital plate short, obtusely conical. Valves of ovipositor robust, with curved apices.

Type species : *Gelastorhinus albolineatus* Brunner, 1893.

The species of this genus are distributed in the Oriental and Ethiopian zoogeographical regions. Only one species occurs in Madagascar.

Gelastorhinus edax Saussure, 1899

(Text-figs. 5, 10)

♂. Antenna 21–22 segmented, narrow ensiform. Fastigium of vertex above concave, with median carinula. Lateral carinae of pronotum almost parallel; dorsum slightly tectiform; posterior margin of metazona rounded. Prosternal process low pyramidal. Mesosternal interspace elongated, narrow, widening at anterior part. Elytron narrow, with subacute apex. Cercus long, almost straight, exceeds end of subgenital plate, compressed, narrow, with obtuse apex.

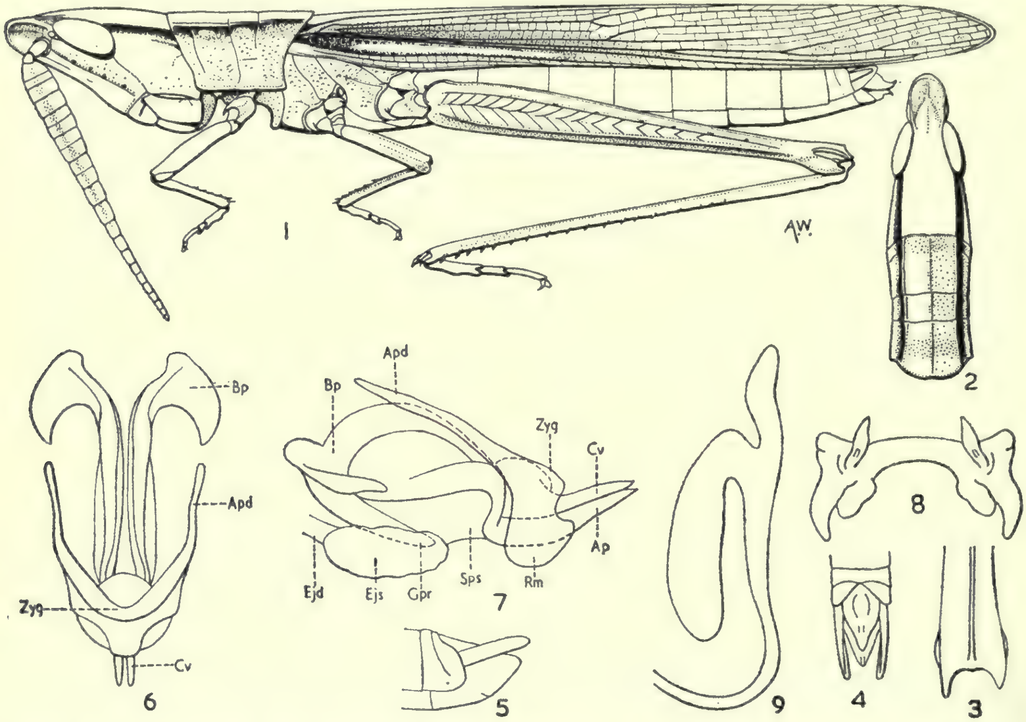

FIG. 5. *Gelastorhinus edax* Saussure, 1899. 1, female. 2, head and pronotum. 3, distal end of right hind femur, from above. 4, end of male abdomen, from above. 5, the same, lateral view. 6, phallic complex from above, ectophallic membrane and epiphallus removed. 7, the same, lateral view. 8, epiphallus. 9, spermatheca.

Phallic complex: zygoma of cingulum short; apodemus short and narrow; valve of cingulum straight, narrow, with subacute apex, basal valve of penis with strongly excurved, large, lateral expansion; apical valve of penis narrow, almost straight with acute apex; flexure moderately thin. Epiphallus with articulated ancorae and lobiform, with tendency to bilobate, lophi.

General colouration greenish or ochraceous, with lateral stripe which begins from posterior margin of eye, runs along lateral lobe of pronotum, below lateral carina and through middle of elytron, gradually diffusing towards middle.

♀. As the male, but larger. Subgenital plate shallowly trilobate. Ovipositor short with valves acute at apices. Spermatheca with narrow apical diverticulum and long, narrow, downcurved preapical diverticulum.

Length of body ♂ 23·2–24, ♀ 38·3–41·5 ; pronotum ♂ 3·9–4·0, ♀ 6·5–7·5 ; elytron ♂ 19·2–20·6, ♀ 31·0–34·0 ; hind femur ♂ 14·5–15·0, ♀ 19·5–21·0 mm.

Madagascar Nord : Joffreville, 15.xii.1947, 2 ♀ (*P. Cachan*).

Madagascar Ouest : Andobo, 190 m. forêt Antsingy, det. Antsalova, ii.1957, 1 ♂, 1 ♀ (*P. Griveaud*).

Madagascar Centre : Ambatofinandrahana, 1180 m. 28.vii.1957, 1 ♀ (*P. Griveaud*). Tananarive, Tsimbazaza, 18.ii.1949, 1 ♀, 23.i.1948, 1 ♀. Ambohitantely, Lisière forestière, 4.ii.1948, 2 ♂ (*P. Cachan*).

DURONIA Stål, 1876

Rodunia I. Bolivar, 1908 : 100 ; Rehn, 1914 : 77.

Of medium size. Integument finely rugose. Antenna ensiform. slightly shorter than head and pronotum together. Head conical ; fastigium of vertex parabolic, with fine median and short lateral carinulae, fastigial foveolae absent ; frons strongly oblique, straight ; frontal ridge sulcate on whole length, with high, short, downwardly diverging, lateral carinulae. Dorsum of pronotum flat, wide, with sharp, strong carinae ; lateral carinae straight, almost parallel or slightly diverging backwards ; only posterior sulcus crossing dorsum ; metazona slightly shorter than prozona, its posterior margin obtusangular. Mesosternal interspace open. Elytra and wings fully developed ; membrane of elytron semi-transparent, reticulation moderately dense. Hind femur slender reaching or slightly exceeding end of abdomen ; lobes of hind knee of equal length, upper ones with rounded apices, lower external angular, internal acutangular. Arolium large. Male supra-anal plate elongate angular. Cercus elongate conical, with obtuse apex. Subgenital plate short, conical, with acute apex. Ovipositor short, valves robust, wide, curved at apices.

Type species : *Phlaeoba chloronota* Stål, 1876.

Duronia chloronota (Stål, 1876)

(Text-fig. 10)

Phlaeoba chloronota Stål, 1876 : 48.
Phlaeoba viridula var. *liturata* I. Bolivar, 1889 : 98 ; Dirsh, 1962 : 86.
Phlaeoba laeta I. Bolivar, 1890 : 310. **syn. n.**
Phlaeoba tricolor Karny, 1907 : 368 ; Dirsh, 1962 : 86.
Rodunia acuminata I. Bolivar, 1912 : 78 ; Dirsh, 1962 : 86.
Duronia victoriana Rehn, 1914 : 77 ; Dirsh, 1962 : 86.

♂. Antenna 18–20 segmented. Facial carinae sharp, regularly excurved. Lateral carinae of pronotum straight, almost parallel, or slightly divergent, or slightly excurved ; lower margin of lateral lobe curved. Prosternum with weak transverse convexity. Mesosternal interspace about twice as long as its width, with slightly incurved lateral margins. Elytron exceeds end of abdomen, with oblique apex ; intercalary vein of medial area absent or very weak. Hind wing narrow. Hind femur narrow, slender, exceeds end of abdomen.

General colouration brown, greyish, buff, straw-yellow, greenish, green ; dorsal part of body and elytra often green or lighter shade of brownish than lateral parts ; sometimes there is dark brown stripe along lateral lobe of pronotum, below lateral carina, which runs along elytron as well ; sometimes median and lateral carinae of pronotum dark brown. Wing colourless or slightly greenish at basal part.

♀. As the male, but larger. Posterior margin of subgenital plate shallowly trilobate.

Length of body ♂ 22·0–30·0, ♀ 28·0–44·0 ; pronotum ♂ 3·6–5·0, ♀ 5·5–7·0 ; elytron ♂ 16·4–23·0, ♀ 19·0–35·0 ; hind femur ♂ 13·0–16·0, ♀ 17·6–24·0 mm.

The Madagascar specimens of this species which were described as *Duronia laeta* (I. Bolivar) have no differences, except the individual ones, from the African specimens of *Duronia chloronota* (Stål). All Madagascar specimens fit very well into African series and cannot be distinguished even as a geographical race. They have the same range of variability of the characters as the continental series (Dirsh 1962).

Madagascar Nord : Joffreville, 15.xii.1947, 1 ♀.

Madagascar Centre : Ankadimanga, Manjakandriana, xii.1957, 1 ♀ (*J. Elie*). Ambohitantely, Lisière de forêt, 4.ii.1948, 1 ♂ (*P. Cachan*). Tananarive, Tsimbazaza, 23.i.1948, 3 ♀. Soavina, Sud-Ouest d'Ambositra, i.1951, 1 ♀ (*R. Paulian*). Marololo, 1.xii.1947, 1 ♀ (*J. Douccet*). Dct. Majunga, forêt Ankàrafantsika, 120 m., xii.1950, 1 ♀ (*E. Raharizonina*).

PARALOBOPOMA Rehn, 1914

Paralobopoma Rehn, 1914 : 73.
Sagonacris Ramme, 1929 : 263 ; Ramme, 1931 : 918.

Small. Integument slightly rugose, shiny. Antenna narrow ensiform, longer than head and pronotum together. Head acutely conical ; fastigium of vertex elongate angular, with obtuse apex, concave, with median carinula ; frons slightly incurved ; frontal ridge slightly, roundly protruding between antennae, shallowly sulcate, with obtuse carinulae. Pronotum subcylindrical ; median carina distinct ; lateral carinae parallel in prozona and mostly obliterated in metazona ; one sulcus crossing dorsum ; metazona much shorter than prozona, its posterior margin obtusangularly incurved. Mesosternal interspace open. Elytra narrow elongated, lobiform, lateral, partly covering tympanum. Hind femur slender ; lobes of hind knee of equal length. Arolium moderately large. Male supra-anal plate elongate angular ; cercus narrow conical, with subacute apex. Subgenital plate in profile subconical, from posterior view apex obtuse. Valves of ovipositor moderately slender, with curved apices.

Type species : *Paralobopoma bugoiensis* Rehn, 1914.

Paralobopoma tananarive sp. n.

(Text-fig. 6)

♂ type. Antenna about twice as long as head and pronotum together, 19 segmented. Lateral carinulae of frontal ridge obtuse ; facial carinae almost obliterated. Median carina of pronotum low, obtuse, with longitudinal suture ; lateral carinae weak ; metazona one third of length of prozona, its posterior margin obtusangularly excised, lateral edges excurved ; lower margin of lateral lobes, in anterior half, strongly excised. Mesosternal interspace short, wide, widening in frontal direction. Elytron very narrow, partly covering tympanum and reaching second abdominal tergite. Hind femur long, far exceeds end of abdomen ; spines of hind tibia gradually becoming longer towards distal end.

Phallic complex : zygoma of cingulum moderately short ; apodemus long ; valve of cingulum long, slightly curved, from above with obtuse apex ; basal valve of penis large, strongly expanded and excurved ; apical valve of penis narrow, curved, with acute apex ; flexure thin. Epiphallus with articulated ancorae and shallowly bilobate lophi.

General colouration blackish-olive-green ; along whole body above, from apex of fastigium of vertex to supra-anal plate there is bright yellow stripe ; middle of face blackish-green ; bright yellow stripe running from antenna to clypeus, at basal part connected with yellow lower part of gena ; sides of body blackish-green ; legs olive green ; hind tibia dark bluish-green, at apical part with pinkish tinge.

♀. As the male, but larger. Lateral carinae of pronotum sometimes developed in metazona as well. Ovipositor elongated, with straight, slender valves, slighly curved at apices. There is no yellow pattern on whole body and face ; general colouration olive green or brownish. Spermatheca with short apical and large, downcurved, sac-like preapical diverticula.

Length of body ♂ 13·5–15·0, ♀ 20·6–22·4 ; pronotum (along median carina) ♂ 2·6–2·8, ♀ 3·4–3·5 ; elytron ♂ 2·5–2·6, ♀ 3·0–3·3 ; hind femur ♂ 10·6–11·0, ♀ 13·0–13·5 mm.

Madagascar Centre : Tananarive, ii–iii. 1950, 16 ♂, 12 ♀.

Type and paratypes in California Academy of Sciences. 3 ♂, 3 ♀ paratypes in the British Museum (Natural History).

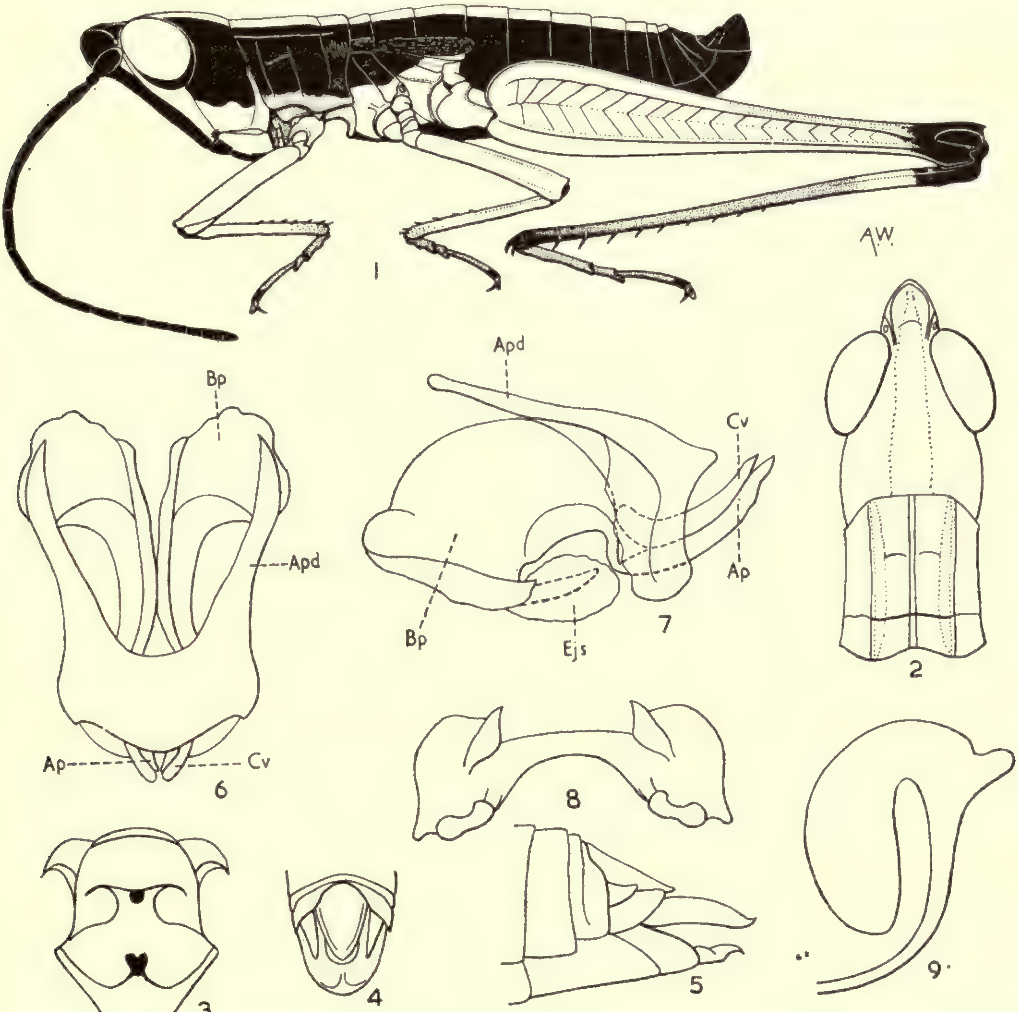

FIG. 6. *Paralobopoma tananarive* sp. n. 1, male. 2, head and pronotum. 3, meso- and metasternum. 4, end of abdomen, male. 5, end of abdomen, female. 6, phallic complex from above, ectophallic membrane and epiphallus removed. 7, the same, lateral view. 8, epiphallus. 9, spermatheca.

The new species varies in coloration. Males in the whole series preserve the same pattern and coloration ; females vary from olive-green, light brown, to dark brown ; some of them with blackish lateral stripe which begins from the eye and runs through whole side of body, some of them without stripe, uniformly coloured.

The new species is rather near to *Paralobopoma bugoiensis* Rehn, 1914, but differs by the following characters :

Male more slender, with longer antenna and more elongated hind femur ; posterior margin of metazona of pronotum more excised ; elytron comparatively longer and narrower. Female differs by more slender body and by elongated, slender ovipositor, with narrow, straight valves. Structure of the phallic complex is rather similar in both species.

GYMNOBOTHRUS I. Bolivar, 1889

Gymnobothrus I. Bolivar 1889 : 100.
Ogmothela Karsch, 1896 : 260 ; Uvarov, 1953 : 119.
Pseudochirista I. Bolivar, 1909 : 291 ; Uvarov, 1953 : 119.
Orthochirista Sjöstedt, 1933 : 215 ; Uvarov, 1953 : 119.

Small. Integument finely rugose. Antenna filiform, slightly shorter or longer than head and pronotum together. Head subconical ; fastigium of vertex angular, concave, with lateral carinulae and obtuse apex ; fastigial foveolae low, not seen from above, narrow, shallow and rugose ; frons oblique, slightly excurved ; frontal ridge almost flat or sulcate, with obtuse or obliterated lateral carinulae, gradually diverging downwards. Pronotum slightly constricted ; median carina strong ; lateral carinae well developed, strongly or slightly incurved ; three sulci crossing dorsum, only posterior one crossing median carina ; metazona as long as or slightly longer than prozona, its posterior margin obtusangular. Mesosternal interspace open. Elytra and wings fully developed or shortened ; membrane of elytron semi-transparent, reticulation moderately dense ; intercalary vein of medial area present. Hind femur slender ; lobes of hind knee of equal length, with rounded apices. Arolium moderately large. Male supra-anal plate elongate angular. Cercus narrow conical, straight, with obtuse apex. Subgenital plate short conical, with obtuse apex. Ovipositor short, moderately robust, with curved valves, lower valve with rounded external lateral projection.

Type species : *Gymnobothrus linea-alba* I. Bolivar, 1889.

Key to Species

1 (2) Lateral carinae of pronotum in prozona angularly incurved, in metazona divergent (Fig. 7) . . . . ***madacassus*** Bruner

2 (1) Lateral carinae of pronotum in prozona slightly, regularly incurved, in metazona excurved and divergent (Fig. 8) . . . . . ***variabilis*** Bruner

Gymnobothrus madacassus Bruner, 1910

(Text-figs. 7, 10)

♂. Antenna shorter than head and pronotum together, 22–23 segmented. Fastigium of vertex concave, with obtuse apex ; frontal ridge shallowly sulcate. Lateral carinae of pronotum angularly incurved in prozona and divergent in metazona ; metazona longer than prozona ; lateral lobe of pronotum higher than its length, its lower margin strongly curved. Mesosternal interspace wider than its length. Elytron narrow, far exceeds end of abdomen, with rounded apex. Hind wings moderately narrow. Hind femur far exceeds end of abdomen.

Phallic complex: zygoma of cingulum short and wide; apodemus moderately short; valve of cingulum narrow, comparatively long; basal valve of penis with expanded and excurved end; apical valve of penis narrow, with acute apex; flexure moderately thin. Epiphallus with comparatively large, articulated ancorae, lophi finger-shaped, with hook-shaped apices.

General colouration brownish; dorsum of pronotum with wide, lateral, longitudinal stripes, but lateral carinae light ochraceous; lateral lobe of pronotum, in middle, with brown stripe, diffusing in anterior part, and below it with ochraceous, oblique stripe; lower side of hind femur orange-red; hind wing colourless.

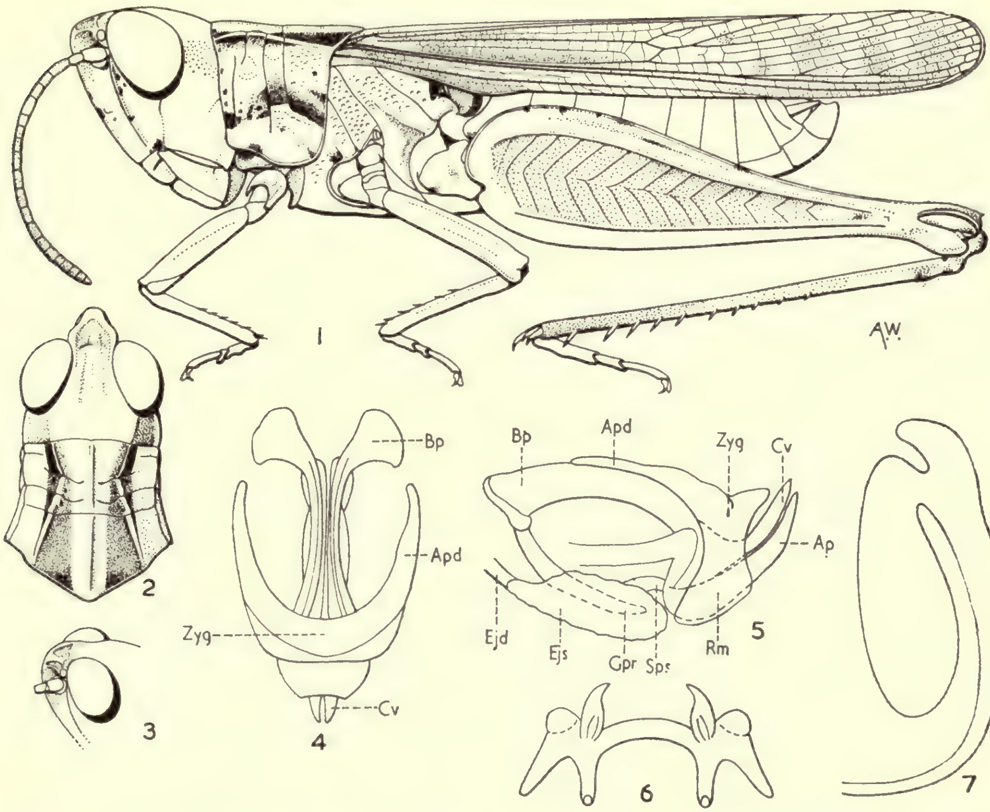

Fig. 7. *Gymnobothrus madacassus* Bruner, 1910. 1, male. 2, head and pronotum, from above. 3, fastigium of vertex, tilted sidewards to show fastigial foveola. 4, phallic complex from above, ectophallic membrane and epiphallus removed. 5, the same, lateral view. 6, epiphallus. 7, spermatheca.

♀. As the male, but larger. Antenna 23–25 segmented. Posterior margin of subgenital plate straight, with acutangular projection in middle. Spermatheca with short, curved apical diverticulum and large, downcurved, sac-like preapical diverticulum.

Length of body ♂ 14·0–14·8, ♀ 21·0–21·5; pronotum ♂ 2·7–3·2, ♀ 4·0–4·2; elytron ♂ 11·5–13·6, ♀ 16·0–18·0; hind femur 9·0–10·6, ♀ 12·4–12·6 mm.

This species is very near to *Gymnobothrus temporalis* (Stål, 1876). Possibly it represents only a geographical race.

When describing this species Bruner did not designate a specific type. Here his male from Tamatave in the Berlin Museum is designated as the type.

Madagascar Centre : Tananarive, Tsimbazaza, 17.vii.1947, 2 ♂, 2 ♀.
Madagascar Est : Ranomafana, Ifanadiana, 1 ♂. Perinet, 1 ♀.
Madagascar Sud : Fort Dauphin, 2 ♂ (*R. Paulian*).

Gymnobothrus variabilis Bruner, 1910

(Text-figs. 8, 10)

♂. Antenna about as long as head and pronotum together, 23–24 segmented. Fastigium of vertex strongly concave with angular, obtuse apex; frontal ridge with shallow sulcus. Lateral carinae of pronotum slightly, regularly incurved in prozona, excurved and divergent in metazona; metazona longer than prozona; lateral lobe of pronotum higher than its length; its lower margin curved. Mesosternal interspace wider than its length. Elytron narrow, far exceeds end of abdomen, its apex rounded. Hind wing moderately narrow.

Phallic complex: zygoma of cingulum short and wide; apodemus short, slender; valve of cingulum narrow; basal valve of penis expanded and strongly excurved; apical valve of penis comparatively long, narrow, slightly curved, with acute apex; flexure comparatively thick. Epiphallus with articulated ancorae; lophi finger-shaped with hooks at apex.

General colouration brownish; head and dorsum of pronotum sometimes with yellowish median, longitudinal stripe; posterior angle of lateral lobe of pronotum often with short ochraceous stripe; subcostal area with whitish longitudinal stripe; hind wing colourless; lower side of hind femur ochraceous, sometimes orange-reddish; hind tibia dirty ochraceous, at basal part with paler ring.

♀. As the male, but larger. Antenna 24–25 segmented. Posterior margin of subgenital plate straight, with small, angular, median projection. Spermatheca with short, curved apical diverticulum and large, downcurved, sac-like preapical diverticulum.

Length of body ♂ 13·2–16·3, ♀ 20·0–23·2; pronotum ♂ 2·6–3·2, ♀ 4·0–4·2; elytron ♂ 11·8–16·0, ♀ 15·5–18·6; hind femur ♂ 8·3–10·6, ♀ 11·9–14·0 mm.

This species is very near to the African species *Gymnobothrus linea-alba* I. Bolivar, 1889. It differs only by more incurved lateral carinae of pronotum, which in *G. linea-alba* are incurved only slightly. Possibly they are races of the same species.

Describing this species on the basis of both sexes Bruner did not designate a type. Here the male in the Berlin Museum is designated as specific type.

Madagascar Nord: dct. Diego Suarez, Mont. des Français, ii.1947, 1 ♂, 2 ♀ (*A. Robinson*).

Madagascar Nord-Ouest: dct. Majunga, forêt Ankarafantsika, 120 m. xii.1959, 3 ♂. Nosy Be, Hellville, 5.ix.1947, 1 ♂, 3 ♀. Nosy Mitsio, 13.i.1960, 4 ♂, 3 ♀ (*R. Paulian*).

Madagascar Nord-Est: Ambodivoangy, Maroantsetra, 2 ♂, 2 ♀. Ampijoroa, 170 m. Ankarafantsika, i.1957, 1 ♂ (*E. Raharizonina*).

Madagascar Ouest: Andobo, 190 m. forêt Antsingy, dct. Antsalova, ii.1957, 3 ♂ 1 ♀ (*P. Griveaud*).

Madagascar Centre: Ankadimanga, Manjakandriana, xii.1957, 2 ♂, 2 ♀ (*J. Elie*). La Mandraka, 22.i.1948, 2 ♂, 1 ♀ (*R. Paulian*). Tananarive, Tsimbazaza, 17.vii. 1947, 5 ♂, 10 ♀ (*P. Cachan*). Soavina, Sud-Ouest d'Ambositra, i.1951, 1 ♀ (*R. Paulian*).

Madagascar Est : Pce. de Tamatave, Fénérive-Est Station forestière de Taratasy, vii.1958, 1 ♂, 1 ♀ (*J. Elie*). Pce. de Tamatave, Ambodiatafana, vi.1958, 4 ♂, 4 ♀ (*Razamanfidimby*). Ile Sainte-Marie, Ambatoroa, vi.1959, 2 ♀ (*E. Razafimandimby*). Station Agric. de Brickaville, 3 ♀. Tamatave, Ile Sainte-Marie, Ilot Madame, xi.1958, 1 ♂, 1 ♀ (*J. Elie*). Station Agric. Ivoloina, xi.1958, 1 ♀ (*J. Elie*). Mahanoro, 1 ♀ (*A. Molet*). Ranomafana, Ifanadiana, 1 ♂, 1 ♀. Perinet, 3 ♂, 2 ♀. Ankazoka, 1130 m. Route Lakato, x.1957, 1 ♀ (*P. Griveaud*).

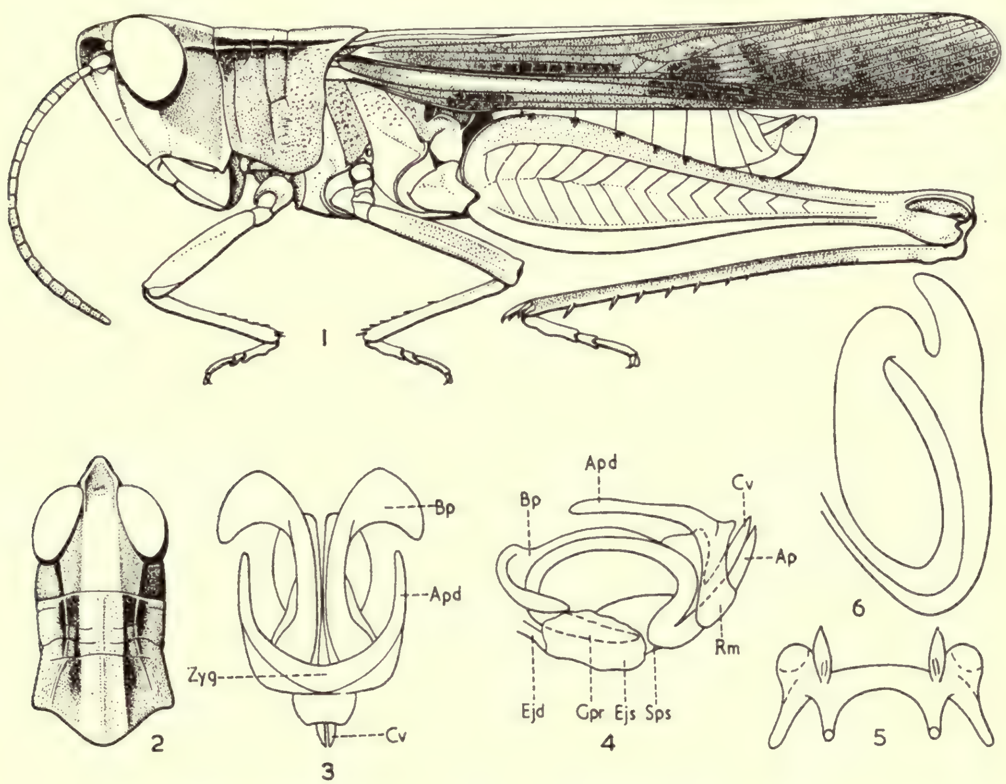

FIG. 8. *Gymnobothrus variabilis* Bruner, 1910. 1, male. 2, head and pronotum from above. 3, phallic complex from above, ectophallic membrane and epiphallus removed. 4, the same, lateral view. 5, epiphallus. 6, spermatheca.

Madagascar Sud-Ouest : Sept Lacs, 50 m. Tuléar, vii.1957, 2 ♂ (*A. Robinson*). Banian, 70 m. Ankazoabo, vii.1957, 3 ♂ (*A. Robinson*). Lambomakandro, 500 m. Tuléar, vii.1957, 1 ♂ (*A. Robinson*). Beloha, 100 m. Ambovombe, vi.1957, 1 ♀ (*A. Robinson*).

Madagascar Sud-Est : Tsivory, 16.viii.1948, 1 ♂ (*R. Paulian*).

Madagascar Sud : Fort Dauphin, 14 ♂, 6 ♀ (*R. Paulian*). Dct. Amboasary, Ifotaka, iii.1960, 1 ♀ (*R. Paulian*).

PARACINEMA Fischer, 1853

Of medium size, moderately slender. Antenna filiform, longer than head and pronotum together. Fastigium of vertex elongate angular, slightly concave, almost flat, with obtuse, well developed lateral carinulae, fastigial foveolae absent; frons oblique, straight; frontal ridge sulcate, with obtuse lateral carinulae, constricted at apex and forming acute angle with fastigium of vertex. Pronotum weakly tectiform, almost flat, with obtuse median carina; crossed by posterior sulcus; lateral carinae poorly developed, slightly incurved, almost straight; metazona slightly longer than prozona, its posterior margin obtusangular with apex slightly excised. Mesosternal interspace longer than its width. Elytra and wings fully developed; intercalary vein of medial area of elytron well developed and finely serrated; membrane transparent, with moderately sparse reticulation. Hind femur slender; lower lobes of hind knee acutely angular; hind tibia slightly expanded towards apex; spurs not specialized. Arolium large. Male supra-anal plate elongate, with slightly attenuate, rounded apex and curved sides. Cercus subconical, narrow, with obtuse apex. Subgenital plate narrow conical. Ovipositor relatively long, slender, with curved valves; upper valve with serrated upper external margin; lower valve with angular, external lateral projection.

Type species: *Gryllus tricolor* Thunberg, 1815.

Paracinema tricolor (Thunberg, 1815)

(Text-fig. 14)

Gryllus tricolor Thunberg, 1815: 254.
Paracinema tricolor madecassa Key, 1936: 391. **Syn. n.**

♂. Antenna 25 segmented. Fastigium of vertex above shallow concave; vertex convex; lateral carinulae of frontal ridge slightly diverging downwards. First and second transverse sulci of pronotum reaching dorsum, but do not cross median carina; lateral lobe slightly longer than its height, with lower margin curved and shallowly excised in anterior half. Elytron slightly or far exceeds end of abdomen, oblique at apex. Hind wing narrow. Hind femur exceeds end of abdomen.

General colouration green or brown with all intermediate shades; lateral margins of dorsum of pronotum with brown, parallel stripes; cubital area of elytron sometimes with brownish longitudinal stripe; base of hind wing slightly greenish; hind knee brown; hind tibia bright red.

♀. As the male, but larger. Antenna 23–25 segmented. Apex of subgenital plate rounded and strongly protruding.

Length of body ♂ 17·7–26·9, ♀ 31·5–39·0; pronotum ♂ 3·7–5·0, ♀ 5·5–7·4; elytron ♂ 16·2–24·5, ♀ 25·6–35·0 mm. (The measurements are based on Madagascar material only.)

Madagascar Nord: Mt. d'Ambre, Diégo Suarez, xii.1948, 3 ♂, 11 ♀. (*R. Paulian*); ix.1957, 1 ♂ (*J. Elie*). Diégo Suarez, Mt. des Français, ii.1959, 1 ♂ (*A. Robinson*). Ambilobe, iv.1951, 1 ♂, 1 ♀ (*R. Paulian*). Joffreville, 15.xii.1947, 1 ♀ (*P. Cachan*).

Madagascar Nord-Ouest: Ambanja, iii.1951, 1 ♂ (*R. Paulian*). Namoroka, ix.1952, 1 ♀ (*R. Paulian*). Nosy Be, Pointe à la Fièvre, vii.1957, 1 ♀ (*R. Paulian*). Dct. Majunga, forêt Ankarafantsika, 120 m. xii.1959, 4 ♀ (*E. Raharizonina*).

Madagascar Nord-Est: Dct. Sambava, Marojejy, Ambinanitelo, 500 m. xii.1958, 1 ♂, 1 ♀ (*E. Raharizonina*). Ivontaka, dct. Maroanisetra, iii.1958 1 ♀.

Madagascar Ouest: Morondava, forêt sud de Befasy, i.1956, 2 ♀ (*R. Paulian*). Namoroka, Vilanandro, ix.1952, 1 ♀. Andobo, 190 m. forêt Antsingy, dct. Antsalova, ii.1957, 1 ♂, 3 ♀ (*P. Griveaud*).

Madagascar Centre : Dct. Moramanga, Sandrangato, xii.1959, 1 ♀ (*P. Griveaud*). Ankadimanga, Manjakandriana, xii.1958, 1 ♂, 1 ♀ (*J. Elie*). Plateau Soaindran, 2090 m. Andrigitra–Ambalavao, 15.i.1958, 1 ♀ (*R. Paulian*). Forêt Vakoana,

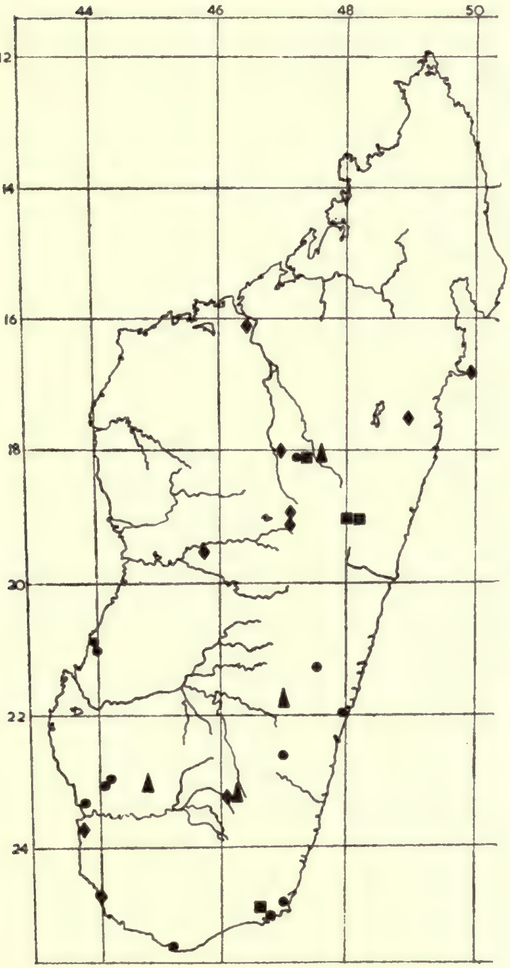

FIG. 9. Geographical distribution.

◆—*Acrida madecassa* (Brancsik, 1893).
▲—*Acrida subtilis* Burr, 1902.
●—*Chromacrida rodamae* (Saussure, 1899).
■—*Chromacrida brunneriana* (I. Bolivar, 1893).

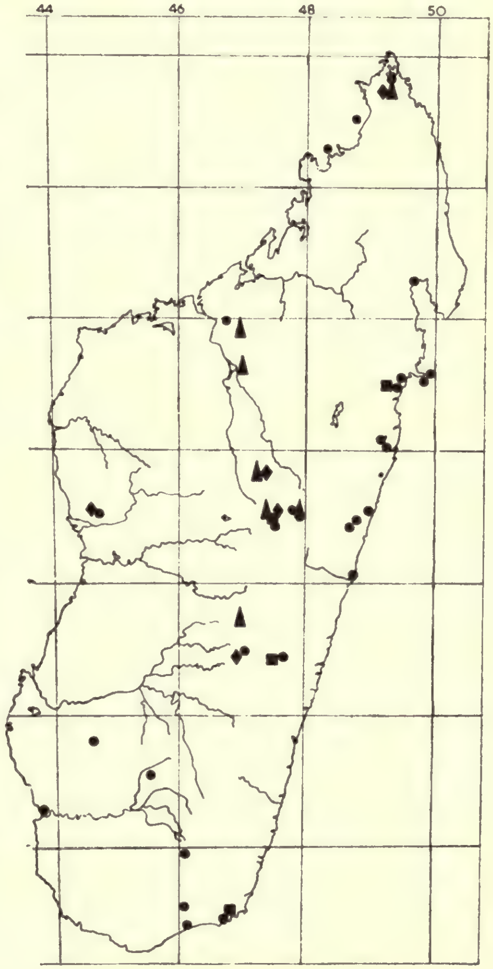

FIG. 10. Geographical distribution.

◆—*Gelastorhinus edax* Saussure, 1899.
▲—*Duronia chloronota* (Stål, 1876).
■—*Gymnobothrus madacassus* Bruner, 1910.
●—*Gymnobothrus variabilis* Bruner, 1910.

Ambalamarovandrana, 1530 m. Andrigitra–Ambalavao, 22.i.1958, 1 ♂, 2 ♀ (*P. Griveaud*). Ampijoroi, Tsaramandroso, 2 ♀. Ambohiby, 1500 m. Tsiroanomandidy, 25.v.1948, 1 ♀. Tananarive, Tsimbazaza, 19.i.1948, 7 ♀ (*A. R. V.*).

Madagascar Est : Nosivola, 3 ♀. Station Agricole Brickaville, 3 ♂. Perinet, 1 ♂, 6 ♀. Ranomafana, Ifanadiana, 1 ♀. Andranomandrevy, Didy, 1039 m. Ambatondrazaka, x.1956, 2 ♀ (*P. Griveaud*).

Madagascar Sud-Ouest: Dct. Tuléar, Isalo, 1000 m. xii.1959, 1 ♀ (*E. Raharizonina*. Sept-Lacs, 100 m. Tuléar, 14.ii.1958, 2 ♂, 3 ♀ (*P. Griveaud*). St. Augustin, 8 m. Tuléar, 11.ii.1958, 1 ♀ (*P. Griveaud*).

Madagascar Sud-Est : Sakavondro, 225 m. forêt Isaka, Fort Dauphin, 24.ii.1958, 1 ♀ (*P. Griveaud*).

When studying series of *Paracinema tricolor* from Madagascar, it became apparent that they cannot be considered as a separate subspecies. They fit into the series of continental *Paracinema*, disregarding all the subspecies of this species.

Most probably *Paracinema tricolor* forms ecological races, which are not connected with geographical distribution and may occur in any place with suitable ecological conditions.

Paracinema tricolor is widely distributed in Africa, Arabia, South Europe, Asia Minor and the Middle East.

AIOLOPUS Fieber, 1853

Epacromia Fischer 1853 : 296 ; Uvarov, 1942 : 336.

Of medium size. Integument finely dotted. Antenna filiform, as long as or longer than head and pronotum together. Fastigium of vertex elongate, angular, slightly concave, with well developed lateral carinulae ; fastigial foveolae trapezoidal, shallow ; frons oblique ; frontal ridge flat, slightly narrowed at apex, without lateral carinulae. Pronotum very slightly tectiform and slightly constricted in prozona ; median carina obtuse, linear, lateral carinae absent. Dorsum crossed by posterior sulcus only ; metazona longer than prozona, its posterior margin obtusangular, with rounded or obtuse apex. Mesosternal interspace slightly wider than its length. Elytra and wings fully developed ; intercalary vein of medial area of elytron well developed and finely serrated ; membrane transparent, reticulation modeıately sparse. Hind femur comparatively slender ; lobes of hind knee rounded. Arolium of medium size. Male supra-anal plate elongate angular. Cercus narrow conical, with obtuse apex. Subgenital plate short, subconical, with obtuse apex. Ovipositor short, with moderately robust valves, curved at apices.

Type-species : *Gryllus thalassinus* Fabricius, 1781.

Aiolopus rodericensis (Butler, 1876)

(Text-figs. 11, 14)

Epacromia rodericensis Butler, 1876 : 410 ; Uvarov, 1928 : 364.
Epacromia famulus (sic) var. *pusilla* I. Bolivar, 1895 : 378 ; I. Bolivar, 1912 : 270.
Aeolopus perpusillus (nom. n.) I. Bolivar, 1912 : 270. **Syn. n.**
Aeolopus laticosta I. Bolivar, 1912 : 268. **Syn. n.**
Aeolopus aldabrensis I. Bolivar, 1912 : 269. **Syn. n.**
Aeolopus dociostauroides I. Bolivar, 1912 : 269. **Syn. n.**
Aeolopus fasciatipes I. Bolivar, 1912 : 270. **Syn. n.**

♂. Antenna as long as head and pronotum together, 22–24 segmented. Fastigium of vertex narrow angular ; fastigial foveolae elongated, irregularly trapezoidal, narrowing towards frontal ridge, very shallow ; frontal ridge flat or slightly depressed at ocellus. Posterior margin of metazona of pronotum obtusangular, almost rounded ; lower margin of lateral lobe of pronotum in anterior half shallowly excised. Elytron far or only slightly exceeds end of abdomen, its apex rounded ; intercalary vein of medial area of elytron, in apical end turned towards medial vein. Hind wing moderately narrow. Hind femur comparatively wide. Hind tibia shorter than femur.

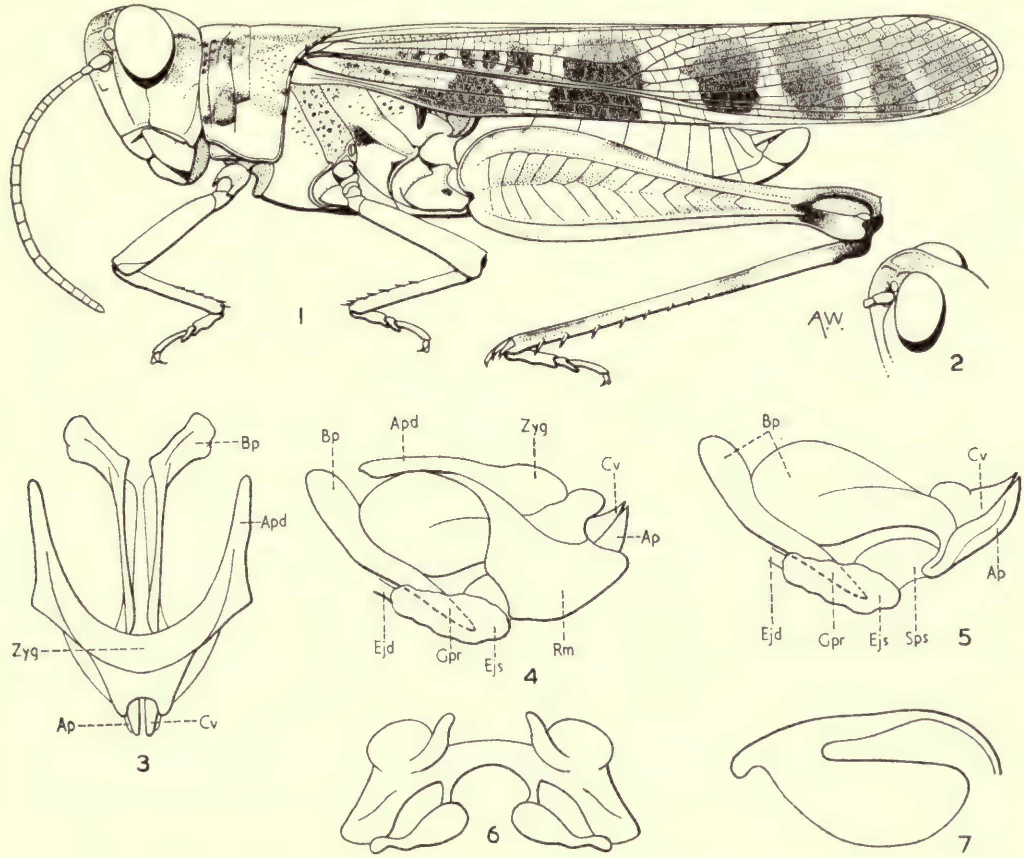

FIG. 11. *Aiolopus rodericensis* (Butler, 1876). 1, male. 2, fastigium of vertex, tilted sidewards to show fastigial foveola. 3, phallic complex from above, ectophallic membrane and epiphallus removed. 4, the same, lateral view. 5, the same, but cingulum, except valves, removed. 6, epiphallus. 7, spermatheca.

Phallic complex : zygoma of cingulum narrow ; apodemus moderately short, forming lateral, angular projection, valve of cingulum short, robust, with acute apex ; basal valve of penis excurved and moderately expanded ; apical valve of penis short, thick, with acute apex ; flexure moderately thin. Epiphallus with narrow, articulated ancorae and large, lobiform lophi of irregular form.

General colouration brownish or greenish, dorsum of pronotum sometimes with light X-shaped pattern ; lateral lobe of pronotum in anterior half with brownish spot ; elytron with two or

three transverse light fasciae and sometimes with small light irregular spots, sometimes uniformly brownish ; hind wing colourless or slightly greenish at basal part ; external side of hind femur with three indefinite, elongated, brownish spots, which sometimes are obliterated; internal side pale ochraceous, with incomplete, blackish, basal, transverse fascia and complete preapical fascia ; internal side of hind knee blackish ; base of hind tibia creamy-whitish, followed by narrow blackish ring, then wide whitish ring followed by slightly blackish ring and blue or bluish at distal part ; spines with blackish apices ; hind tarsus of pinkish shade.

♀. As the male, but larger. Antenna 24–25 segmented. Subgenital plate weakly trilobate, with obtusangular apex. Spermatheca with small, short apical diverticulum and large, downcurved, sac-like preapical diverticulum.

Length of body ♂ 17·0–22·0, ♀ 21·0–29·2 ; pronotum ♂ 2·8–4·3, ♀ 4·0–5·5 ; elytron ♂ 14·0–21·0, ♀ 19·0–26·7 ; hind femur ♂ 8·5–12·5, ♀ 12·0–15·8 mm.

Madagascar Nord-Ouest : Nosy Mitsio, 14.i.1960, 1 ♂ (*R. Paulian*). Ampijoroa, 170 m. Ankarafantsika, i.1957, 1 ♀. Ampijoro, Tsaramandroso, 2 ♂, 1 ♀.

Madagascar Ouest : Morondava, forêt sud de Befasy, i.1956, 4 ♂, 6 ♀ (*R. Paulian*). Vilanandro, Namoroka, ix.1952, 1 ♀ (*R. Paulian*). Antsingy, 63 km. Est Maintirano forêt, vii.1949, 1 ♀ (*R. Paulian*).

Madagascar Centre : Tananarive, 2 ♂, 3 ♀.

Madagascar Est : Fianarantsoa, xi.1957, 3 ♂, 4 ♀ (*J. Elie*). Ankadimanga, Manjakandriana, xii.1957, 2 ♀ (*J. Elie*).

Madagascar Sud-Ouest : Lac Ihotry, 40 m. Morombe, 8.vii.1957, 1 ♂, 3 ♀. Sept Lacs, 50 m. Tuléar, ii–vii.1958, 3 ♂, 7 ♀ (*P. Griveaud*). Lac Tsimananpetsotsa, Andranomby, 20.iv.1948, 1 ♀. Lambomakandro, 500 m. Tuléar, vii.1957, 1 ♂ (*A. Robinson*).

Madagascar Sud : St. Augustin, 8 m. Tuléar, 12.ii.1958, 4 ♂ (*P. Griveaud*). Ambovombe, iv.1953, 4 ♂, 5 ♀ (*R. Paulian*) ; 20.vi.1957, 26 ♂, 38 ♀ (*P. Griveaud*). Behara, ii.1954, 1 ♀ (*R. Paulian*). Fort Dauphin, 1 ♂, 2 ♀ (*R. Paulian*).

By the widened hind femur and shortened tibia, *A. rodericensis* belongs to the group of *Aiolopus savignyi* (Krauss, 1890). It can be distinguished from the other species of the genus by the large, very shallow, elongated trapezoidal fastigial foveolae and by the hind tibia being bluish or blue.

Since the specific types of synonymized species were not designated in the original descriptions, the following specimens are designated below as the lectotypes.

Epacromia rodericensis Butler, 1876. In Butler's description only the male is mentioned. However, in the measurements the length is given as 12–18 mm. This indicates that he had several specimens.

In the collection of the British Museum (Natural History) there are one male, two females and one nymph, representing the series on which Butler based his description. They bear the same registration labels—" 76 13 " and blue labels " Guliver " (name of collector). One female has a round label " Epacromia rodericensis Butler's Type ". According to the handwriting this specimen was selected probably by W. F. Kirby, and was mistaken for the male. It is possible however, that Butler himself confused the sexes. Since the selection of the type was not published, here the single male is designated as lectotype. It corresponds with the sex of Butler's description and represents one of the specimens of his series.

Epacromia famulus (sic) var. *pusilla* I. Bolivar, 1895 was described on the basis of several specimens of both sexes from the Islands La Digue, Praslin and Mahé

(Seychelles). In 1912 I. Bolivar raised it to specific level and changed the name to *perpusillus*. The specific type was not designated. Here the male from Mahé is designated as the lectotype.

Aeolopus laticosta I. Bolivar, 1912 was described from several specimens of both sexes from Chagos Islands (Seychelles). The specific type was not designated. Here, the male from Diego Garcia is designated as the type.

Aeolopus aldabrensis I. Bolivar, 1912 was described from several specimens of both sexes from Aldabra, Assumption, Cosmoledo and St. Pierre (Aldabra group). He described several variations of this species denoted as var. A, B, C. However he did not designate the specific type. Here the syntype female from Aldabra is designated as the lectotype. On the label, the specimen apparently is denoted as the type by I. Bolivar, but the designation was not published.

Aeolopus dociostauroides I. Bolivar, 1912 was described on the basis of several specimens of both sexes from the Seychelles group of Islands. No specific type was designated. Here the male from Coetivy is designated as the lectotype. Apparently the specimen bears I. Bolivar's original label denoting it as the type.

Aeolopus fasciatipes I. Bolivar, 1912 was described from several specimens of both sexes from Farquhar Atoll, Providence and Cerf Island. The specific type was not designated. Here the female from Farquhar Atoll is designated as the type. The specimen bears I. Bolivar's original label " Type ".

All the types and paratypes, except *Epacromia famulus* var. *pusilla*, are in the British Museum (Natural History).

When all available material of this species was studied, it became apparent that it represents a continuous series of variation. The variants differ in size and stoutness of body, length of elytra, stoutness of head, pattern and coloration. Other characters, such as width of frontal ridge which depends on the stoutness of head, do not exceed the range of variability ; *A. laticosta* being one of the extreme variants in this respect. Fastigial foveolae may be more or less shallow, but their form is constant in all populations.

It is doubtful whether the synonymized species could be regarded as geographical races, as all of them may be placed within the series of Madagascar material. Possibly some of them represent ecological forms or may merely exhibit a range of individual variability.

PTERNOSCIRTUS Saussure, 1884

Conipoda Saussure, 1884 : 192 ; Uvarov, 1940 : 117.

Of medium size, moderately slender. Integument finely rugose. Antenna filiform, longer than head and pronotum together. Fastigium of vertex angular, slightly concave, with obtuse lateral carinulae ; fastigial foveolae absent ; frons oblique, straight, frontal ridge narrow at apex widening towards base with shallow sulcus or depression and obliterated lateral carinulae. Pronotum saddle-shaped, with weak median and without lateral carinae ; dorsum crossed by three sulci ; metazona much longer than prozona, its posterior margin widely obtusangular, almost rounded, anterior angle of lateral lobe of pronotum attenuate and protruding externally. Mesosternal interspace wider than its length. Elytra and wings fully developed ; elytron

narrow ; intercalary vein of medial area straight, strong, weakly serrated ; membrane transparent ; reticulation sparse. Anterior and middle legs thin, elongated. Hind femur slender ; lower lobes of hind knee rounded. Internal spurs of hind tibia about half again as long as external, slightly expanded. Arolium small. Male supra-anal plate elongate angular. Cercus narrow conical, straight, with obtuse apex. Subgenital plate short subconical. Ovipositor of medium length, moderately slender, with curved valves ; lower valve with small, rounded, external lateral projection.

Type species : *Conipoda calcarata* Saussure, 1884.

Pternoscirtus calcaratus (Saussure, 1884)

(Text-fig. 15)

Conipoda calcarata Saussure, 1884 : 193.
Pternoscirtus calcaratus (Saussure, 1884) ; Uvarov, 1940 : 117.
Acrotylus bicornis Sjöstedt, 1918 ; 7. **Syn. n.**

♂. Body hairy. Antenna as long as or shorter than head and pronotum together, 20 segmented. Fastigium of vertex narrow, with narrow angular apex and high lateral carinulae. Lower margin of lateral lobe of pronotum curved, posterior angle rounded. Mesosternal interspace twice or more as wide as its length. Elytron exceeds end of abdomen, its apex rounded ; intercalary vein of medial area in apical part approximate to median vein, hind wing moderately narrow. Hind femur exceeds end of abdomen. Spines of hind tibia sparse, gradually becoming longer towards apex of tibia.

General colouration sandy-grey or brownish ; antenna and anterior legs with brownish rings ; external side of hind femur with scattered, small, brownish spots and row of spots on lower carinula ; upper and internal side with two brownish fasciae. Base of internal side of hind knee brownish ; hind tibia whitish, with two wide, bluish rings in middle of basal half and in apical part ; hind wing transparent, colourless or with slightly bluish shade at base.

♀. As the male, but larger. Antenna 19 segmented. Apex of subgenital plate obtusely angular.

Length of body ♂ 15·5–18·2, ♀ 18·7–26·3 ; pronotum ♂ 3·4–3·9, ♀ 4·0–5·2 ; elytron ♂ 15·0–19·6, ♀ 20·0–26·0 ; hind femur ♂ 10·0–11·2, ♀ 11·2–14·4 mm. (These measurements are based on Madagascar material only.)

This species is variable in body size and colouration.

The series from Madagascar have no significant differences from the African series.

The type of *Acrotylus bicornis* Sjösted, 1918, was examined and proved to be *Pternoscirtus calcaratus* (Sauss.).

Madagascar Nord: Nosy Komba, xi.1956, 2 ♂. Ambanja, 25.ix.1947, 1 ♀ (*R. Paulian*).

Madagascar Ouest : Ankazoabo, 26.ix.1940, 1 ♀ (*Clément*). Banian, 70 m. Ankazoabo, 14.vii.1957, 4 ♂, 1 ♀ (*P. Griveaud*).

Madagascar Est : Tamatave, Fénérive-Est. xi.1958, 1 ♀ (*J. Elie*). Tamatave, Ambodiatafana, vi.1958, 2 ♂, 4 ♀ (*Randimby*).

Madagascar Sud-Ouest : Sakarana, Lambomakandro, 3 ♀.

Madagascar Sud : Sept Lacs, 100 m. Tuléar, 14.ii.1958, 1 ♂ (*P. Griveaud*). Fort Dauphin, Lebanon, viii.1948, 1 ♂ (*R. Paulian*). Faux Cap, 1 ♂ (*A. Robinson*). Fort Dauphin, Antanimora, 300 m. xii.1959, 1 ♀ (*E. Raharizonina*). Ste-Luce, 7 m. Fort Dauphin, 23.ii.1958, 1 ♂, 1 ♀ (*P. Griveaud*). Androy, Tranomaro, 15.viii.1948, 1 ♀ (*R. Paulian*).

TRILOPHIDIA Stål, 1873

Small. Integument strongly rugose, tuberculate and hairy. Antenna filiform in basal two-thirds and slightly thickened in apical third, longer than head and pronotum together. Head subconical; fastigium of vertex angular, apex truncate, concave, with undulated lateral carinulae and with upper fastigial foveolae; frons slightly oblique, straight; frontal ridge sulcate, with obtuse, almost parallel lateral carinulae. Pronotum tectiform, slightly constricted in prozona, strongly tuberculate; median carina in prozona forms two high tooth-like projections, in metazona carina sharp; dorsum crossed by two sulci; lateral carinae irregular, in front of first sulcus forming tooth-like lateral tubercles. Metazona longer than prozona, slightly inflated, its posterior margin acutangular with obtuse apex. Mesosternal interspace wider than its length. Elytra and wings fully developed, intercalary vein of medial area of elytron strong, finely serrated, membrane parchment-like. Hind femur moderately robust. Spurs of hind tibia not specialized. Arolium small. Male supra-anal plate elongate angular. Cercus narrow conical, with obtuse apex. Subgenital plate short, conical. Ovipositor short, with robust, curved valves; lower valve with small, rounded, external lateral projection.

Type species: *Oedipoda cristella* Stål, 1873.

Trilophidia cinnabarina Brancsik, 1893

(Text-figs. 12, 15)

♂. Antenna 18–19 segmented. Fastigium of vertex elongate, its lateral carinae high, almost S-shaped; fastigial foveolae irregularly rhomboidal, wide, rather shallow; sulcus of frontal ridge rather deep. Prozona of pronotum with two tooth-like projections compressed laterally; three pairs of large lateral tubercles between sulci, diminishing in size towards metazona, and several tubercles in upper part of lateral lobe. Mesosternal interspace about twice as wide as its length. Elytron exceeds end of abdomen, with apex rounded and anterior margin in basal part strongly projecting. Hind wing moderately narrow. Hind femur comparatively short, slightly exceeds end of abdomen. Hind tibia shorter than femur.

Phallic complex: zygoma of cingulum moderately narrow; apodemus short; valve of cingulum short, in profile triangular with acute apex; basal valve of penis long, with small lateral expansion, apical valve of penis robust, in apical part widened and in lower part slightly projecting, apex acute; flexure comparatively thick. Epiphallus with large, articulated ancorae and large lobiform lophi of irregular shape.

General colouration brown with dark brown spots; antenna with brownish rings; elytron with two or three weak, transverse, brownish fasciae; hind wing in basal part cinnabar-red, apical part blackish; anterior and middle legs with incomplete brownish rings; hind femur with external side brown, upper side with blackish fascia, internal side black with two light fasciae in apical part; lower part of internal side of knee blackish; hind tibia with two brown and two ochraceous rings alternating, spine ochraceous with brown apices.

♀. As the male, but larger. Antenna 20–21 segmented. Apex of subgenital plate obtusangular. Spermatheca with small, short apical diverticulum and large, downcurved, sac-like preapical diverticulum.

Length of body ♂ 14·4–16·7, ♀ 20·0–23·0; pronotum ♂ 3·6–3·8, ♀ 4·0–5·0; elytron ♂ 15·2–17·0, ♀ 17·2–22·0; hind femur ♂ 9·2–10·3, ♀ 10·0–12·0 mm.

Madagascar Nord-Ouest: Nosy Be, 1 ♂ (*R. Paulian*). Dct. Majunga, forêt Ankarafantsika, 120 m. xii.1959, 2 ♀ (*E. Raharizonina*).

Madagascar Ouest: Station Agric. Bas Mangoky, 1 ♂.

Madagascar Est: Mahanoro, 1 ♂, 2 ♀ (*A. Molet*). Dct. Sambara, Marojejy, Ambinanitelo, 500 m. xii.1958, 1 ♀ (*E. Raharizonina*). Brickaville, Anivorano, Sahamany, iii.1960, 1 ♀ (*P. Griveaud*). Ile St. Marie, Ambatoroa, 1 ♂.

Madagascar Sud-Ouest : Sept Lacs, 50 m. Tuléar, vii.1957, 2 ♂ (*A. Robinson*). Lambomkandro, 550 m. Sakaraha, 7.ii.1958, 1 ♀ (*P. Griveaud*).

Madagascar Sud : Fort Dauphin, forêt d'Isaka, iv.1953, 1 ♂ (*R. Paulian*). Androy Tanomaro, 15.viii.1948, 1 ♀ (*R. Paulian*).

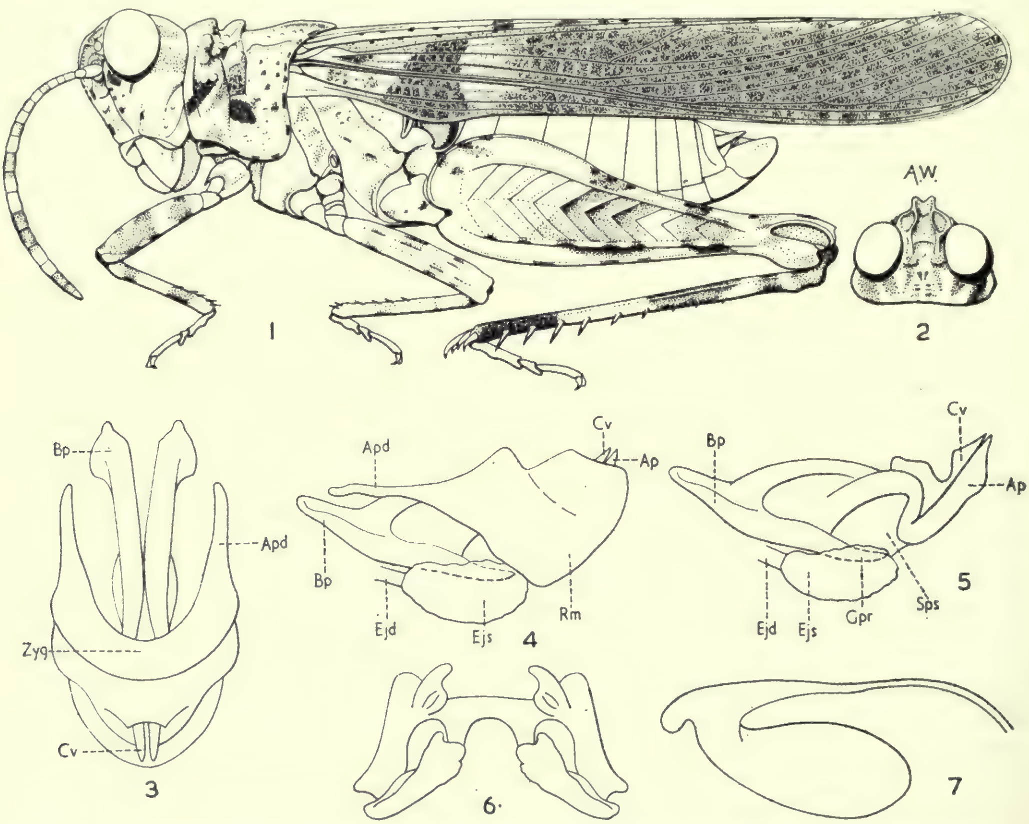

FIG. 12. *Trilophidia cinnabarina* Brancsik, 1893. 1, male. 2, head from above, slightly tilted backwards, 3, phallic complex from above, ectophallic membrane and epiphallus removed. 4, the same, lateral view. 5, the same, but cingulum, except valves, removed. 6, epiphallus. 7, spermatheca.

Trilophidia cinnabarina Brancs. is very near to the African species of the genus. The main difference is the cinnabar-red hind wings. The latter coloration has not been found in African species of the genus.

PYCNOCRANIA Uvarov, 1941

Of medium size or large. Integument strongly rugose. Antenna filiform, longer or shorter than head and pronotum together. Head globular ; fastigium of vertex sloping forwards, wide, with truncate apex and short median and low lateral carinulae ; frons excurved ; frontal ridge wide, flat with rugose surface and almost obliterated lateral carinulae ; small, irregularly tri-

angular, almost rounded, shallow fastigial foveolae present. Pronotum tectiform, median carina higher in prozona than in metazona, crossed and incised by posterior sulcus only; lateral carinae absent. Metazona much longer than prozona, its posterior margin angular, with obtuse apex. Mesosternal interspace much wider than its length. Elytra and wings fully developed; intercalary vein of medial area strongly serrated. Hind femur wide, with slightly expanded lower external area and strongly serrated upper and lower carinae. Spurs of hind tibia not specialized. Arolium small. Male supra-anal plate elongate angular, with obtuse apex. Cercus narrow conical, with obtuse apex. Subgenital plate short, conical, with obtuse apex. Valves of ovipositor short, robust, with curved apices.

Type species : *Chloebora grandidieri* Saussure, 1888.

Pycnocrania grandidieri (Saussure, 1888)

(Text-figs. 13, 15)

Chloebora grandidieri Saussure, 1888 : 33.
Pycnocrania grandidieri (Saussure, 1888) ; Uvarov, 1941 : 298.

♂. Much smaller and less robust than female. Antenna longer than head and pronotum together, 22 segmented. Fastigium of vertex almost flat, slightly concave ; frontal ridge very wide, in lower half obliterated. Surface of pronotum tuberculate ; median carina high, obtuse ; posterior margin of metazona acutangular with slightly incurved sides ; lateral lobe of pronotum higher than its length. Elytron exceeds end of abdomen, with oblique apex ; anterior margin expanded in basal part. Hind wing moderately narrow. Hind femur slightly exceeds end of abdomen.

Phallic complex : zygoma of cingulum short and comparatively narrow ; apodemus moderately long, robust ; valve of cingulum short, comparatively narrow, with acute apex ; basal valve of penis slightly expanded and excurved ; apical valve of penis robust, curved, with posterio-ventral projection and obtuse apex ; flexure thick, robust. Epiphallus with large, articulate ancorae, which form lateral projections ; lophi large, bilobate, with lobes of irregular form.

General colouration brownish ; dorsum of pronotum with faint ochraceous X-shaped pattern ; elytron with brown spots, sometimes forming indistinct transverse fasciae ; hind wing at base light lemon-yellow, in middle of posterior half faint infumate, incomplete fascia present ; external medial area of hind femur grey, in middle with narrow, longitudinal, ochraceous stripe ; internal side of hind femur ochraceous, in lower part reddish ; lower internal lobe of hind knee reddish ; hind tibia blue, at base on internal side with red spot ; spines whitish with brown apices.

♀. As the male, but larger and more robust. Antenna shorter than head and pronotum together, 21 segmented. Posterior margin of metazona obtusangular. Elytron reaching or very slightly exceeding end of abdomen. Subgenital plate with straight apex. Spermatheca without apical diverticulum, preapical diverticulum sac-shaped, downcurved.

Length of body ♂ 23·0–25·7, ♀ 33·0–45·0 ; pronotum ♂ 5·5–7·0, ♀ 8·3–9·0 ; elytron ♂ 19·0–21·2, ♀ 24·0–30·0 ; hind femur ♂ 14·0–15·2, ♀ 17·7–21·0 mm.

Madagascar Ouest : Isalo, viii.1948, 1 ♀ (*R. Paulian*).
Madagascar Centre : Tananarive, Tsimbazaza, 12.i.1948, 1 ♀, 3♂.

GASTRIMARGUS Saussure, 1884

Medium to large. Integument smooth or finely rugose. Antenna filiform, about as long as or shorter than head and pronotum together. Head globular ; fastigium of vertex slightly narrowing forwards, with truncate apex and well developed lateral and weak median carinulae ; frons vertical or slightly oblique ; frontal ridge flat, wide, with parallel, obtuse lateral carinulae. Pronotum tectiform with high, sometimes almost crest-shaped, median carina ; lateral carinae

absent ; prozona sometimes slightly constricted ; no sulci or only weak posterior sulcus crossing medium carina ; metazona longer than prozona, its posterior margin acutangular or elongated acutangular. Mesosternal interspace much wider than its length. Elytra and wings fully developed or shortened ; intercalary vein of medial area of elytron strong, finely serrated ; anterior

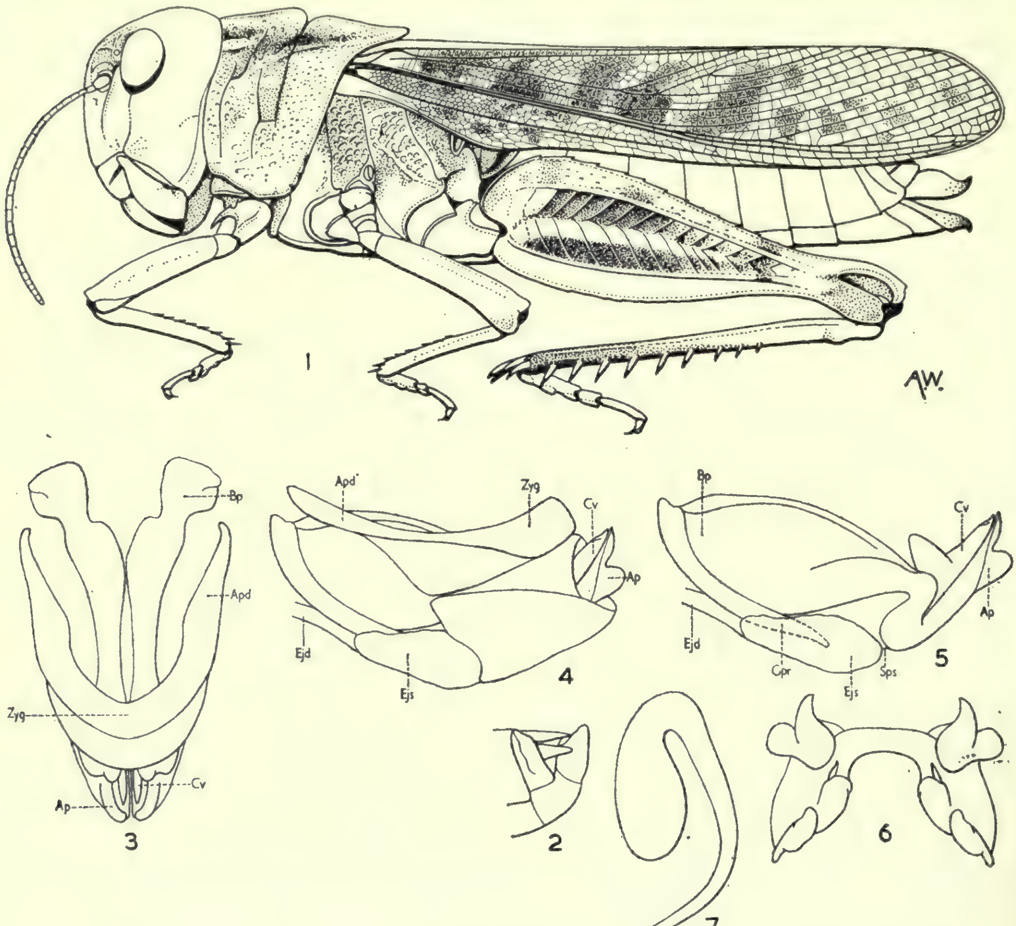

FIG. 13. *Pycnocrania grandidieri* (Saussure, 1888). 1, female. 2, end of male abdomen. 3, phallic complex, from above, ectophallic membrane and epiphallus removed. 4, the same, lateral view. 5, the same, but cingulum, except valves, removed. 6, epiphallus. 7, spermatheca.

half of medial area with thickened transverse veinlets. Hind femur slender. Spurs of hind tibia not specialized. Arolium of medium size. Male supra-anal plate elongate angular, with incurved sides and obtuse apex. Cercus conical, with obtuse apex. Subgenital plate conical, with obtuse apex. Ovipositor short, robust, with curved valves ; lower valve with small, external lateral projection.

Type species : *Gastrimargus verticalis* Saussure, 1884.

Gastrimargus africanus (Saussure, 1888)

(Text-fig. 15)

Oedaleus marmoratus var. *africana* Saussure, 1888 : 39.
Gastrimargus africanus (Saussure, 1888) ; Kirby, 1910 : 227.
Gastrimargus africanus var. *madagascariensis* Sjöstedt, 1928 : 41. **Syn. n.**

♂. Antenna 26 segmented. Fastigium of vertex slightly concave, almost flat, its carinulae excurved, merging with carinulae of frontal ridge. Posterior margin of metazona acutangular and moderately attenuate ; lateral lobe of pronotum higher than its length, its lower margin excurved. Elytron far exceeds end of abdomen, with rounded apex, anterior margin at basal part slightly projecting. Hind femur exceeds end of abdomen. Spines of hind tibia relatively short.

General colouration green or brown with all intermediate shades ; gena with two oblique blackish stripes ; dorsum of pronotum on sides of median carina often with wide dark brown stripes, crossed by light brown stripes, which form an X-shaped pattern ; elytron brownish or blackish with dorsal part often green, crossed by two incomplete, narrow, whitish stripes ; basal part of hind wing lemon-yellow, middle with wide, sharp, dark brown or blackish fascia, apical part colourless, apex of remigium sometimes slightly infumate ; external side of hind femur sometimes with one or two short, oblique brown stripes ; internal side in basal part blackish, in apical ochraceous, sometimes with lighter preapical ring ; base of hind tibia brown, followed by wide whitish ring, distal part crimson-red.

♀. As the male, but larger. Antenna 26–27 segmented. Posterior margin of metazona less acutangular and less attenuate than in male. Subgenital plate with obtusangular, almost straight apex.

Length of body ♂ 23·5–26·6, ♀ 33·0–38·2 ; pronotum ♂ 6·5–7·0, ♀ 9·5–10·0 ; elytron ♂ 24·0–30·2, ♀ 30·9–40·0 ; hind femur ♂ 15·5–17·0, ♀ 20·0–24·2 mm. The measurements based on Madagascar specimens only.

Madagascar Nord-Ouest : Antanambola, Bealanana, xi.1957, 1 ♀ (*J. Elie*).

Madagascar Ouest : Ambohiby, 1600 m. Tsiroanomandidy, 26.v.1948, 1 ♂ (*R. Paulian*). Dct. Miandrivazo, Ambovombe, iii.1960, 1 ♂ (*Cruchet*).

Madagascar Centre : Forêt d'Ambohitantely, 23.xii.1947, 1 ♂ (*R. Paulian*). Forêt Vakoama, Ambalamarovandana, 1530 m. Andringitra—Ambalavao, 21.i.1958, 1 ♀ (*P. Griveaud*). Ambatofinandrahana, 1180 m. 27.vii.1957, 1 ♂, 1 ♀ (*P. Griveaud*). Soavina, Sud-Ouest d'Ambositra, i.1951, 1 ♂ (*R. Paulian*). Mandrotsy, Betroka, 1 ♂ (*J. Elie*). Amboazary Anjozorobe 1340 m. xi.1957, 1 ♀ (*P. Griveaud*). Tananarive, Tsimbazaza, i.1948, 1 ♂, 5 ♀.

Madagascar Est : Station Agric. Lac Alaotra, xi.1947, 1 ♀. Ankasoka, dct. Moramanga, i.1959, 1 ♀ (*P. Griveaud*). Perinet, 1 ♂, 1 ♀. Sandrangato, dct. Moramanga, xii.1959, 1 ♀ (*P. Griveaud*).

Madagascar Sud-Est : Sakavondro, 225 m. forêt Isaka, 24.ii.1958, 2 ♀ (*P. Griveaud*) Ivohibe, Farafangana, 1 ♀.

Madagascar Sud : Fort Dauphin, 1 ♂ (*R. Paulian*).

The series of this species from Madagascar has no differences from the series from Africa. The var. *madagascariensis* Sjös. which Sjöstedt claimed as being of smaller size in a large series proved indistinguishable from the African specimens.

Gastrimargus africanus is generally very variable in body size, relative length of elytra, relative length of hind femur and acuteness of posterior margin of pronotum.

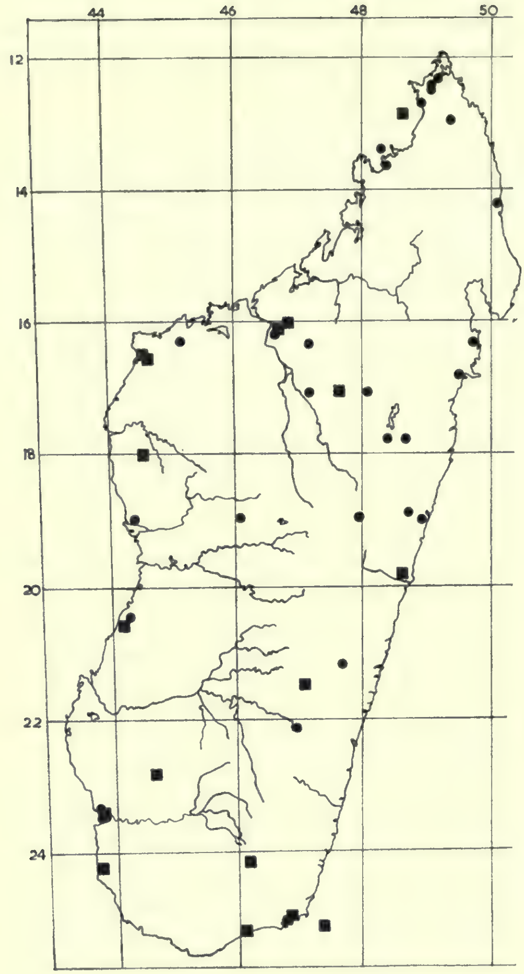

FIG. 14. Geographical distribution.
●—*Paracinema tricolor* (Thunberg, 1815).
■—*Aiolopus rodericensis* (Butler 1876).

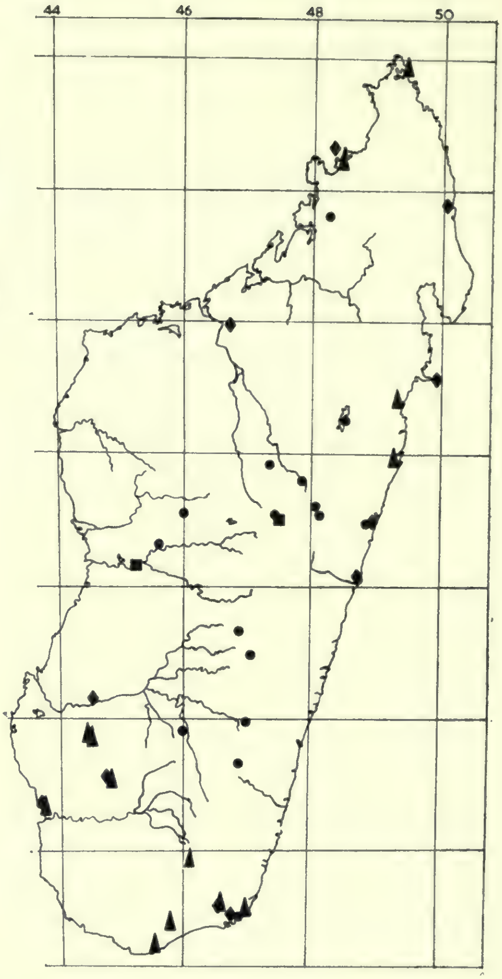

FIG. 15. Geographical distribution.
♦—*Trilophidia cinnabarina* Brancsik, 1893.
■—*Pycnocrania grandidieri* (Saussure, 1888).
▲—*Pternoscirtus calcaratus* (Saussure, 1884).
●—*Gastrimargus africanus* (Saussure, 1888).

OEDALEUS Fieber, 1853

Of medium size. Integument finely rugose and dotted. Antenna filiform, longer than head and pronotum together. Head approximating to subglobular ; fastigium of vertex angular, with truncate apex, flat or slightly concave, with obtuse lateral carinulae ; frons vertical, slightly excurved ; frontal ridge flat or shallowly sulcate, slightly narrowed at apex with obtuse some-

times indistinct, parallel lateral carinulae. Pronotum tectiform or high tectiform, slightly constricted in prozona, with obtuse median and without lateral carinae, with X-shaped pattern on dorsum ; median carina crossed by posterior sulcus only ; metazona slightly longer than prozona, its posterior margin from acutangular to rounded. Mesosternal interspace wider than its length. Elytra and wings fully developed ; intercalary vein of media larea of elytron strong, weakly serrated ; apical half with transparent membrane, sub-costal apical area of hind wind slightly thickened. Hind femur slender. Spurs of hind tibia not specialized. Arolium of medium size. Supra-anal plate of male angular. Cercus narrow conical, with obtuse apex. Subgenital plate conical, with obtuse apex. Ovipositor short, with robust, curved valves ; lower valve with elongate external, lateral projection.

Type species : *Acridium nigrofasciatum* Degeer, 1773.

Oedaleus virgula (Snellan van Vollenhoven, 1869)

(Text-figs. 16, 20)

Oedipoda virgula Snellan van Vollenhoven, 1869 : 11.
Epacromia inclyta Walker, 1870 : 773 ; Uvarov, 1925 : 276.
Oedaleus (*Gastrimargus*) *madecassus* Saussure, 1884 : 115 ; Uvarov, 1925 : 276.
Oedaleus nigrofasciatus var. *virgula* (Snellan van Vollenhoven, 1869) ; Saussure, 1888 : 40.
Oedaleus virgula (Snellan van Vollenhoven, 1869) ; Kirby, 1910 : 226.

♂. Antenna 22–23 segmented. Fastigium of vertex slightly concave ; frontal ridge at ocellus slightly depressed. Pronotum tectiform, its posterior margin obtusangular ; lateral lobe of pronotum higher than its length, lower margin oblique and excurved, anterior angle obtusangular and slightly attenuate, posterior angle rounded. Elytron far exceeds end of abdomen, its apex rounded, intercalary vein of medial area of elytron strongly serrated. Upper external area of hind femur in basal part slightly expanded.

Phallic complex : zygoma of cingulum short and comparatively narrow ; apodemus short and slender ; valve of cingulum short, with acute apex ; basal valve of penis excurved and slightly expanded ; apical valve of penis robust, slightly widened at apical part, with small posterior-ventral projection and acute apex ; flexure moderately thick. Epiphallus with small articulated ancorae and very large, bilobate lophi.

General colouration greenish or brownish ; head, between facial carina and gena, with brown stripe ; dorsum of pronotum with ochraceous or whitish X-shaped pattern, which sometimes is obliterated partly of completely ; elytra with two or three narrow, whitish or ochraceous, incomplete fasciae ; hind wing in basal part lemon-greenish, with weak infumate fascia ; hind femur on both sides of the same colour as general colouration of the specimen ; above, with short, brown, transverse fascia ; hind femur bluish or light brownish.

♀. As the male, but larger. Apex of subgenital plate slightly excurved. Spermatheca with small and short apical diverticulum and large, downcurved, sac-like preapical diverticulum.

Length of body ♂ 16·3–22·0, ♀ 25·7–30·5 ; pronotum ♂ 3·7–5·0, ♀ 5·5–6·7 ; elytron ♂ 15·2–22·0, ♀ 22·0–31·0 ; hind femur ♂ 10·6–13·0, ♀ 14·6–17·5 mm.

Madagascar Nord : Dct. Diégo Suarez, Mont. des Français, ii.1959, 1 ♀ (*A. Robinson*).

Madagascar Nord-Ouest : Ampijoroa, Tsaramandroso, 2 ♂. Nosy Mitsio, i.1960, 1 ♂, 1 ♀ (*R. Paulian*). Nosy Be, Plage de Madirokely, vii.1957, 1 ♂, 4 ♀ (*R. Paulian*).

Madagascar Nord-Est : Ile Sainte-Marie, Ambatoroa, ii.1959, 2 ♂, 2 ♀ (*Razafimandimby*). Ile Sainte-Marie, forêt Ambohidena, x.1960, 3 ♀ (*P. Griveaud*).

Madagasacar Ouest : Morondava, forêt sud de Befasy, i.1956, 2 ♂, 2 ♀ (*R. Paulian*).

Madagascar Est : Pce. de Tamatave, Perinet Fanandiana, x.1958, 4 ♀. Dct. Tamatave, Ambodihatafana, x.1958, 1 ♂, 1 ♀ (*Randimby*). Tamatave, Fénérive, Station forestière de Taratasy, vii.1958, 2 ♂, 1 ♀ (*J. Elie*). Pce. de Tamatave, Station Agric. Ivoloina, vi.1958, 3 ♂, 1 ♀ (*J. Elie*). Antanambé, baie d'Antongil, 1 ♂. Station Agric. de Brickaville, 2 ♀, Perinet, 1 ♂. Ambila, vii.1951, 1 ♀ (*R. Paulian*).

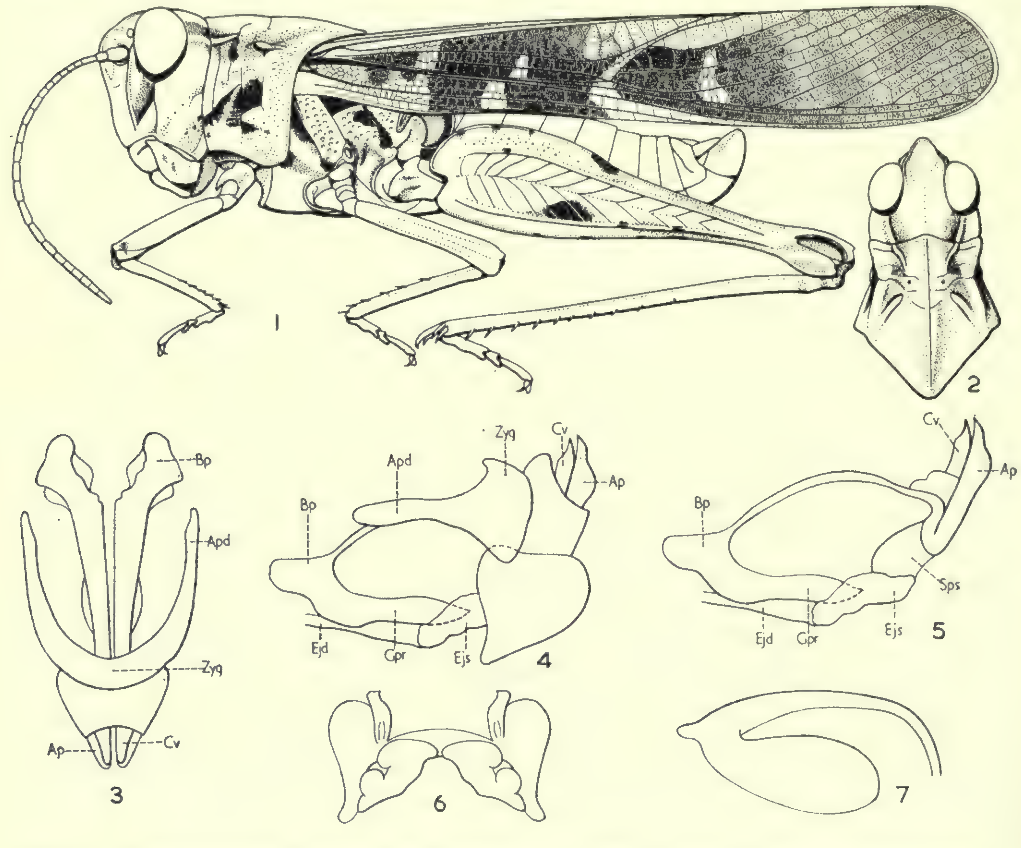

FIG. 16. *Oedaleus virgula* (Snellan van Vollenhoven, 1869). 1, male. 2, head and pronotum from above. 3, phallic complex from above, ectophallic membrane and epiphallus removed. 4, the same, lateral view. 5, the same, but cingulum, except valves, removed. 6, epiphallus. 7, spermatheca.

Madagascar Sud-Ouest : Lambomakandro, 500 m. Tuléar, vii.1957, 1 ♂ (*A. Robinson*). Amboasary, 220 m. Ambovombe, 19.vi.1957; 2 ♂, 1 ♀ (*P. Griveaud*). Tuléar, St. Augustin, iii.1956, 1 ♀ (*A. Robinson*). Sept Lacs 50 m. Tuléar, vii.1957, 3 ♂, 1 ♀ (*A. Robinson*). Lac Iotry, 40 m. Morombe, 8.vii.1957, 1 ♂ (*P. Griveaud*).

Madagascar Sud-Est : Sakavondro, 225 m. Forêt Isaka, Fort Dauphin, 24.ii.1958, 1 ♀ (*P. Griveaud*). Behara, iv.1937, 1 ♀ (*A. Seyrig*). Fort Dauphin, Ste.-Luce, 7 m. 23.ii.1958, 1 ♀ (*P. Griveaud*). Fort Dauphin, Lebanon, viii.1948, 1 ♀ (*R. Paulian*).

Madagascar Sud : Dct. Fort Dauphin, Antanimora, 300 m. xii.1957, 3 ♂ (*E.

Raharizonina). Ampanihy, 250 m. 6.ii.1958, 1 ♀ (*P. Griveaud*). Ambovombe, iv.1953, 1 ♀ (*R. Paulian*).

Oedaleus virgula varies very much in body size, in the pattern of pronotum, which is sometimes uniformly coloured, and in general colouration. This species is very near to the South African *Oedaleus nigrofasciatus* Degeer, 1773, from which it differs by the colouration of the hind tibia, which in *O. nigrofasciatus* is red or reddish, and by the less tectiform pronotum.

LOCUSTA Linnaeus, 1758

Oedipus Berthold, 1827 : 411 ; Roberts, 1941 : 26.
Pachytylus Fieber, 1852 : 5 ; Kirby, 1910 : 228.

Large. Integument smooth or finely dotted. Antenna filiform, about as long as head and pronotum together. Head globular ; fastigium of vertex narrowing forwards with obtuse, almost truncate apex, slightly concave, with weak lateral and median carinae ; frons vertical, excurved ; frontal ridge moderately wide, slightly depressed at ocellus, with parallel almost obliterated lateral carinulae. Pronotum tectiform or constricted in prozona and almost saddle-shaped ; median carina well developed, crossed by posterior sulcus only ; metazona slightly longer than prozona, its posterior margin obtusangular or almost rounded. Mesosternal interspace about as long as wide or slightly longer. Elytra and wings fully developed ; intercalary vein of medial area strong and finely serrated ; anterior part of medial area with dense thickened transverse veinlets. Hind femur slender. Arolium small. Male supra-anal plate angular. Cercus narrow conical, with obtuse apex. Subgenital plate conical, with subacute apex. Ovipositor short, robust, with curved valves ; lower valve with angular, external, lateral projection.

Type species : *Gryllus* (*Locusta*) *migratorius* Linnaeus, 1758.

Locusta migratoria capito (Saussure, 1884)

(Text-figs. 17, 20)

Pachytylus migratorioides var. *capito* Saussure, 1884 : 119.
Locusta capito (Saussure, 1884) ; Kirby, 1910 : 229.

♂. Antenna 25–27 segmented. Head sometimess lightly inflated ; fastigium of vertex longer or shorter than its width. Pronotum tectiform or saddle-shaped ; lateral lobe higher than its length ; posterior margin of metazona angular or rounded. Elytron far exceeds end of abdomen, with rounded apex ; intercalary vein of medial area straight ; anterior part of medial area wider than posterior.

General colouration green, greenish or brown ; dorsum of pronotum with a pair of brown longitidunal stripes or uniformly coloured ; elytra covered with small brownish spots ; hind wing transparent colourless or slightly lemon-yellowish at base ; hind tibia reddish, ochraceous or brownish. (The latter may be a post-mortem change.)

♀. As the male, but larger. Subgenital plate with almost straight, slightly excurved apex.

Length of body ♂ 38·0–44·0, ♀ 36·3–53·5 ; pronotum ♂ 8·4–9·0, ♀ 8·7–11·4 ; elytron ♂ 40·5–45·6, ♀ 40·0–55·5 ; hind femur ♂ 22·0–23·0, ♀ 22·0–30·0 ; maximal width of head ♂ 5·4–7·6, ♀ 6·0–8·7 mm. (All measurements based on available material, not from published sources.)

Locusta migratoria capito occurs in two forms (Phase *Solitaria* and Phase *Gregaria*). The extreme forms are very different, but all intermediate forms (Phase *Transiens*) between them exist. The extreme forms are distinguished below.

Ph. *Solitaria.* Head narrower and not inflated ; fastigium of vertex longer than its width. Pronotum tectiform, its posterior margin angular. Hind femur relatively longer. Female much larger than male.

Ph. *Gregaria.* Head wider and inflated ; fastigium of vertex shorter than its width. Pronotum saddle shaped, its posterior margin rounded or widely obtusangular. Hind femur relatively shorter. Female slightly larger than male.

Ph. *Transiens.* In this phase all the above mentioned characters vary between ph. *gregaria* and ph. *solitaria,* forming all intermediate forms.

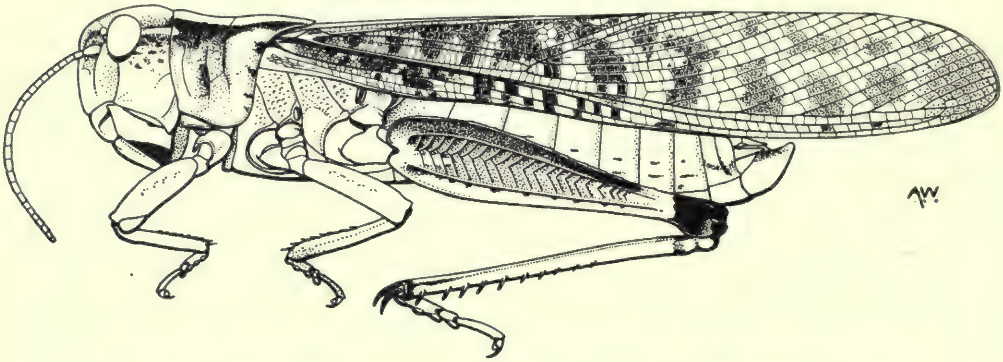

FIG. 17. *Locusta migratoria capito* (Saussure, 1884). Phase gregaria, male.

Madagascar Nord-Ouest : Ankarafantsika, 170 m. i.1957, 1 ♀.

Madagascar Ouest : Andobo, 190 m. forêt Antsingy, dct. Antsalova, ii.1957, 1 ♀ (*P. Griveaud*). Morondrava, forêt sud de Befasy, 1 ♀. Sakarana, Lambomakandro, 9.iv.1956, 1 ♀.

Madagascar Centre : Dct. Ambohimahasoa, forêt Tsarafidy, 1450 m. xii.1959, 1 ♂, 2 ♀ (*P. Griveaud*). Tananarive, Tsimbazaza, 19.i.1948, 3 ♂. Ihosy, iv.1953, 3 ♂ (*R. Paulian*). Ambohitantely, i.1956, 1 ♂, 2 ♀, (*P. Griveaud*). Forêt d'Ambohitantely, 23.xii.1947, 1 ♂ (*R. Paulian*).

Madagascar Est : Ankasoka, 1130 m. Route Lakato, xii.1956, 1 ♀. Toohibe, Farafangana, 1 ♂. Dct. de Moramanga, Ankasoka, 1130 m. i.1959, 2 ♀ (*P. Griveaud*). Perinet, 1 ♂.

Madagascar Sud : Amboasary, 222 m. Ambovombe, 20.vi.1957, 1 ♀ (*P. Griveaud*). Ambovombe, iv.1953, 2 ♀ (*R. Paulian*).

ACROTYLUS Fieber, 1853

Small or medium size. Integument rugose and hairy. Antenna filiform, longer than head and pronotum together. Fastigium of vertex angular, strongly concave, with high lateral carinulae ; fastigial foveolae present, sometimes indistinct ; frons vertical ; frontal ridge sulcate, with high lateral carinulae, strongly constricted at apex and slightly divergent downwards. Pronotum short, saddle-shaped, strongly tuberculate and sculptured in prozona, with well developed median and irregular tuberculate lateral carinae, which are sometimes absent in metazona ; two sulci crossing dorsum ; metazona longer than prozona, its posterior margin rounded or angular.

Mesosternal interspace wider than its length. Elytra and wings fully developed ; intercalary vein of medial area strong and strongly serrated ; membrane semi-transparent. Hind femur slender ; lower lobes of hind knee rounded. Internal pair of spurs of hind tibia longer than external. Arolium small. Male supra-anal plate elongate angular. Cercus straight or slightly curved, with obtuse apex. Subgenital plate short, obtusely conical. Ovipositor short, robust, with curved valves ; lower valve with angular, external lateral projection.

Type species : *Gryllus insubricus* Scopoli, 1786.

KEY TO SPECIES

1 (2) Pronotum saddle-shaped ; posterior margin of metazona rounded. Hind wing with red or yellow base and brown fascia . . ***patruelis*** (Herrich-Schäffer)

2 (1) Pronotum slightly saddle-shaped, approximating to tectiform, with dorsum flattened between lateral carinae ; posterior margin of metazona obtusangular. Hind wing colourless or slightly infumate (Fig. 18) . . . ***aberrans*** Bruner

Acrotylus patruelis (Herrich-Schäffer, 1838)

(Text-fig. 21)

Gryllus patruelis Herrich-Schäffer, 1838 : 157.
Acrotylus patruelis (Herrich-Schäffer, 1838) ; I. Bolivar, 1876 : 363.

♂. Antenna 22–23 segmented. Fastigial foveolae poorly developed ; lateral carinae of frontal ridge sinuate. Pronotum saddle-shaped, with large, low convexities between sulci ; median carina well developed, sharp, crossed by posterior sulcus only ; posterior margin of metazona widely rounded. Elytron far exceeds end of abdomen, narrow, with rounded apex, its anterior margin in basal part slightly projecting ; intercalary vein of medial area straight, in middle of area.

General colouration brown or brownish ; lateral lobe of pronotum with brown H-shaped pattern ; elytron brown, with lighter vannal part ; hind wing in basal part red, with wide, incomplete, brown fascia and colourless apical part, apex sometimes darkened ; hind femur above with three transverse, brown fasciae ; hind tibia greyish or ochraceous.

♀. As the male, but larger. Antenna 24–25 segmented. Subgenital plate with slightly excurved, almost straight apex.

Length of body ♂ 17·0–18·0, ♀ 21·0–23·0 ; pronotum ♂ 2·8–3·0, ♀ 3·2–3·5 ; elytron ♂ 19·0–20·0, ♀ 21·8–23·7 ; hind femur ♂ 9·8–10·2, ♀ 11·5–12·0 mm.

A few specimens of this species from various parts of Madagascar possess yellow instead of red basal part of hind wing.

Madagascar Nord-Ouest : Ampijoroa, 170 m. Ankarafantsika, i.1957, 3 ♂, 2 ♀.

Madagascar Ouest : Isalo, iii.1956, 1 ♂ (*A. Robinson*). Morondava forêt, sud de Befasy, i.1956, 1 ♂ (*R. Paulian*).

Madagascar Centre : Tananarive, 1 ♂.

Madagascar Sud-Ouest : Tuléar, St. Augustin, ii–iii.1958, 1 ♂, 1 ♀ (*P. Griveaud*). Amboasary, 220 m. Ambovombe, 19.vi.1957, 1 ♂ (*P. Griveaud*). Lambomakandro, 500 m. Tuléar, vii.1957, 2 ♀ (*A. Robinson*). Lac Tsimananpetsotsa, Andranomby, iv.1948, 1 ♀ (*R. Paulian*).

Madagascar Sud : Fort Dauphin, Poste Adm. Tsivory. Andabolava, xi.1959, 1 ♀. Ambovombe, iv.1953, 2 ♀ (*R. Paulian*).

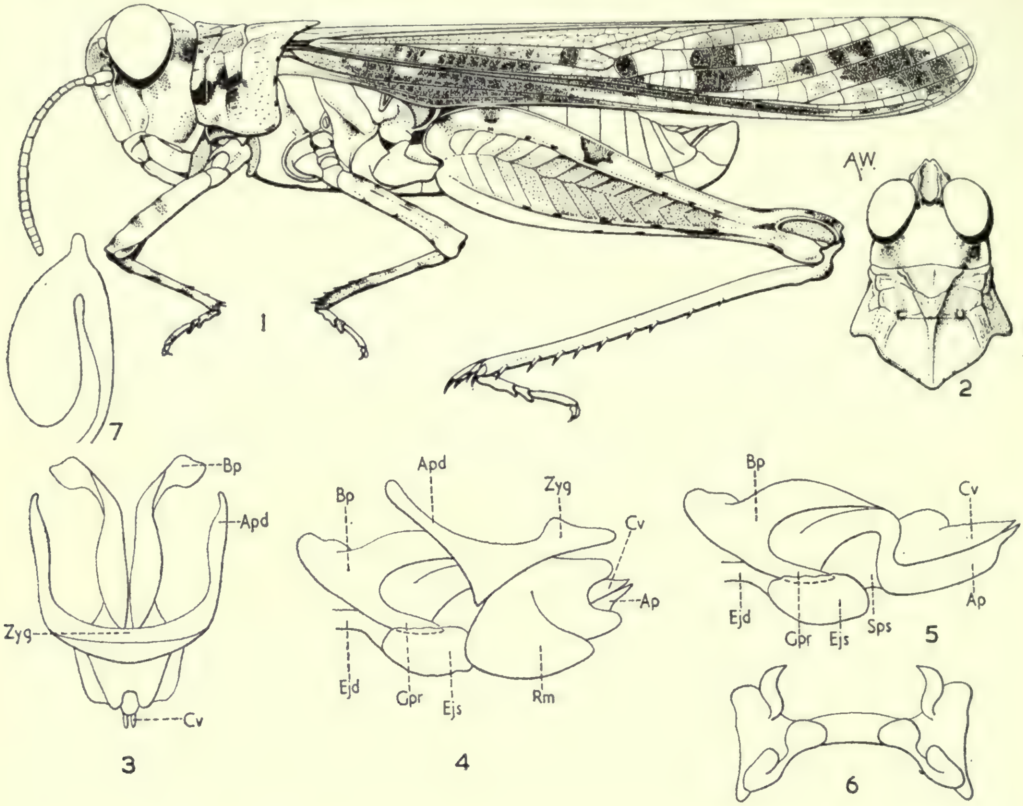

FIG. 18. *Acrotylus aberrans* Bruner, 1910. 1, male. 2, head and pronotum from above. 3, phallic complex from above, ectophallic membrane and epiphallus removed. 4, the same, lateral view. 5, the same, but cingulum, except valves, removed. 6, epiphallus. 7, spermatheca.

Acrotylus aberrans Bruner, 1910

(Text-figs. 18, 21)

♂. Antenna 21–22 segmented. Fastigium of vertex deep and narrow ; fastigial foveolae poorly developed ; sulcus of frontal ridge deep ; lateral carinulae slightly divergent, almost parallel. Pronotum slightly saddle-shaped, approximating to tectiform ; median carina low, lateral carinae in prozona strongly converging backwards, forming inverse-triangular elevation of prozona, disconnected from lateral carinae of metazona ; these form a pair of tubercles in front of posterior sulcus and are strongly divergent in anterior part of metazona, in posterior part they are obliterated ; posterior margin of metazona obtusangular. Mesosternal interspace twice as wide as its length. Elytron exceeds end of abdomen, with rounded apex ; anterior margin in basal part slightly projecting ; intercalary vein of medial area straight, oblique, strongly serrated. Hind femur moderately elongated, exceeds end of abdomen.

Phallic complex : zygoma of cingulum short and wide ; apodemus slender, moderately long ; valve of cingulum large, with acute apex ; basal valve of penis strongly excurved and slightly expanded ; apical valve of penis long, robust, with slightly expanded ventral side and acute

apex ; flexure thick, robust. Epiphallus with small, articulated ancorae and bilobate lophi forming large lobes.

General colouration brown ; below lateral carinae of prozona and on lateral lobes of pronotum two dark brown, oblique stripes ; tubercles in front of posterior sulcus ochraceous ; elytron brown, medial area dark brown, with whitish spot in apical part ; hind wing colourless or slightly infumate ; hind femur above with three fasciae, basal and apical being weak and middle one large and sharp, triangular in shape ; hind tibia red, spines blackish.

♀. As the male, but larger. Antenna 22–23 segmented. Subgenital plate with slightly sinuate apex. Spermatheca with short, small apical diverticulum and large, downcurved, sac-like preapical diverticulum.

Length of body ♂ 11·0–13·6, ♀ 15·3–18·0 ; pronotum ♂ 2·4–2·7, ♀ 3·2–3·5 ; elytron ♂ 11·5–14·0, ♀ 13·5–16·5 ; hind femur ♂ 7·5–9·0, ♀ 9·0–10·0 mm.

Acrotylus aberrans is aberrant on account of the obtusangular posterior margin of pronotum, which is usually rounded in this genus.

Madagascar Est : Route de Tamatave, km. 22, 10.x.1948, 1 ♀ Ambatofitorana, km. 303 rte. de Mananjary, 2 ♂, 1 ♀.

Madagascar Sud-Ouest : Lac Tsimananpetsotsa, Andranomby, 20.iv.1948, 1 ♂. (*R. Paulian*). St. Augustin, 8 m. Tuléar, 12.ii.1958, 1 ♂, 2 ♀ (*P. Griveaud*). Banian, 70 m. Ankazoabo, vii.1957, 5 ♂ (*A. Robinson*). Ambovombe, vi.1957, 6 ♂, 1 ♀ (*P. Griveaud*). Amboasary, 220 m. Ambovombe, 20.vi.1957, 5 ♂, 3 ♀ (*P. Griveaud*). Lac Iotry, 40 m. Morombe, vii.1957, 4 ♂ (*A. Robinson*) ; 1 ♂, 1 ♀ (*P. Griveaud*).

CALEPHORUS Fieber, 1853

Oxycoryphus Fischer, 1853 : 311 ; Rehn, 1902 : 317.

Small and slender. Integument slightly rugose, almost smooth. Antenna compressed and widened, shorter than head and pronotum together. Head conical. Fastigium of vertex elongate angular, weakly convex, almost flat, with sharp marginal carinulae ; frons strongly oblique, incurved ; frontal ridge high, narrow, sulcate, with obtuse lateral carinulae, constricted at apex. Pronotum slightly tectiform, with sharp median and strong lateral carinae angularly incurved at prozona ; dorsum and median carina crossed by posterior sulcus only ; metazona longer than prozona, its posterior margin elongate angular, with obtuse apex. Mesosternal interspace wider than its length. Elytra and wings fully developed ; intercalary vein of medial area of elytron strong, finely serrated ; medial and cubital area slightly widened ; membrane in apical third transparent, reticulation sparse. Apical part of subcostal area of hind wing sclerotized. Hind femur slender ; lower lobes of hind knee rounded, internal pair of spurs of hind tibia about twice longer than external. Arolium small. Male supra-anal plate angular. Cercus narrow conical, with obtuse, slightly incurved apex. Subgenital plate short, subconical, with obtuse apex. Ovipositor moderately short, robust, with strongly curved valves.

Type species : *Acridium compressicornis* Latreille, 1804.

Calephorus ornatus (Walker, 1870)

(Text-figs. 19, 21)

Stenobothrus ornatus Walker, 1870 : 764.
Calephorus ornatus (Walker, 1870) ; I. Bolivar, 1914 : 99.

♂. Antenna 21 segmented. Fastigium of vertex acutangular ; fastigial foveolae lower, triangular, very shallow. Pronotum slightly tectiform, with tendency to be saddle-shaped ;

lateral carinae angularly incurved, in prozona straight, divergent forwards, in metazona excurved and divergent backwards, sometimes almost obliterated; lateral lobe longer than its height, with longitudinal callosity in upper anterior and lower posterior part; lower margin sinuate; posterior margin of metazona acutangular. Elytron narrow, well exceeds end of abdomen, apex rounded, anterior margin in basal part forms projection; main veins strongly convex, sharp; medial and cubital area widened, with sparse, parallel, transverse veinlets; intercalary vein of medial area short, beginning about middle of the area, straight, oblique, at apex approximating medial vein and then curved posteriorly, thickened in middle and at curved part.

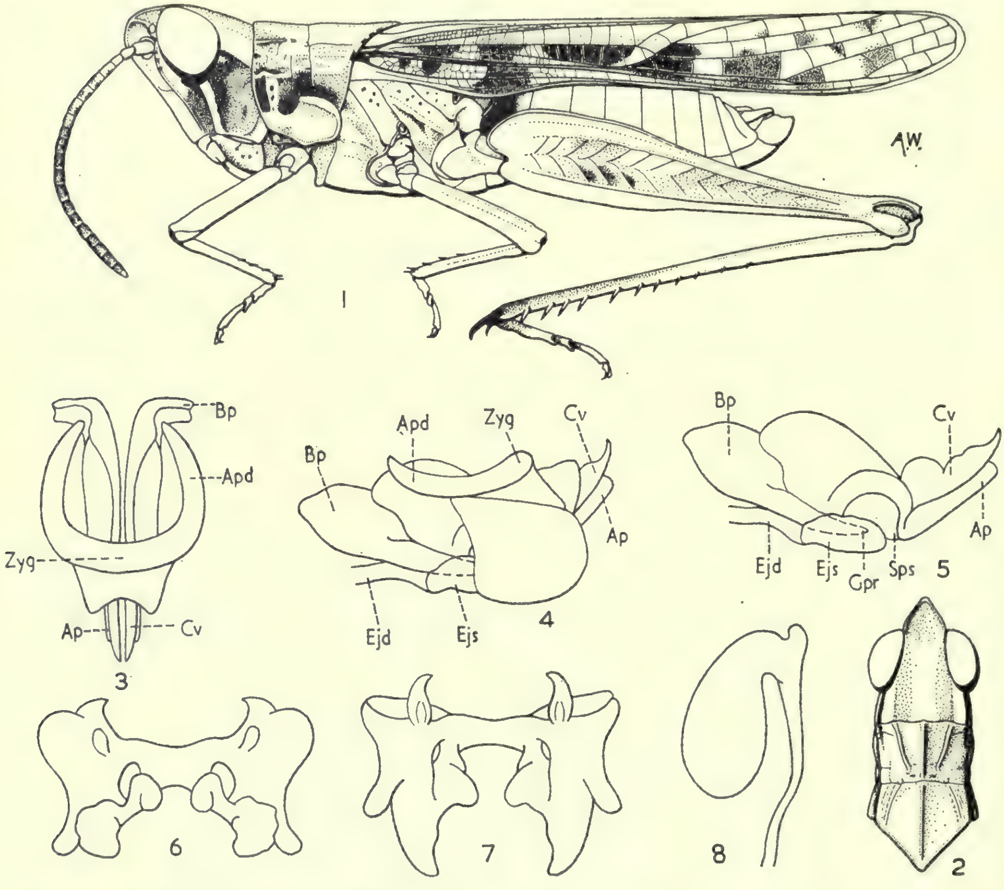

FIG. 19. *Calephorus ornatus* (Walker, 1870). 1, male. 2, head and pronotum from above. 3, phallic complex from above, ectophallic membrane and epiphallus removed. 4, the same, lateral view. 5, the same, but cingulum, except valves removed. 6, epiphallus, lophi in vertical position. 7, the same, but lophi in horizontal position. 8, spermatheca.

Phallic complex: zygoma of cingulum short and moderately narrow; apodemus moderately long, regularly incurved; valve of cingulum large, robust, with acute apex; basal valve of penis strongly excurved and slightly expanded; apical valve of penis short, robust, with obtuse apex; flexure comparatively thick. Epiphallus with small, articulated ancorae; lophi large, bilobate, with irregularly shaped lobes.

General colouration green or brown; lateral carinae of pronotum whitish; elytron with brown spots in medial area and further towards apex; thickening of intercalary vein whitish; hind wing pinkish at basal part and infumate in external part; sometimes colourless, with faint traces of darkening at margins; sclerotized part blackish; hind femur above, in middle with faint brownish fascia; hind tibia brownish.

♀. As the male, but larger. Antenna 19–20 segmented. Fastigium of vertex wider. Posterior margin of metazona of pronotum less acutangular. Elytron comparatively shorter, but exceeds end of abdomen. Subgenital plate with almost straight, slightly excurved apex.

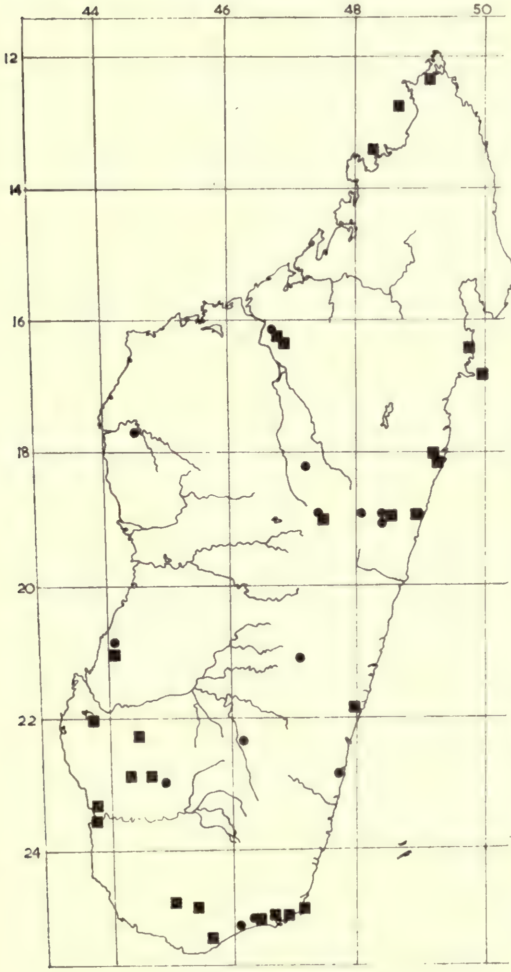

FIG. 20. Geographical distribution.
●—*Locusta migratoria capito* (Saussure, 1884).
■—*Oedaleus virgula* (Snellan van Vollenhoven 1869).

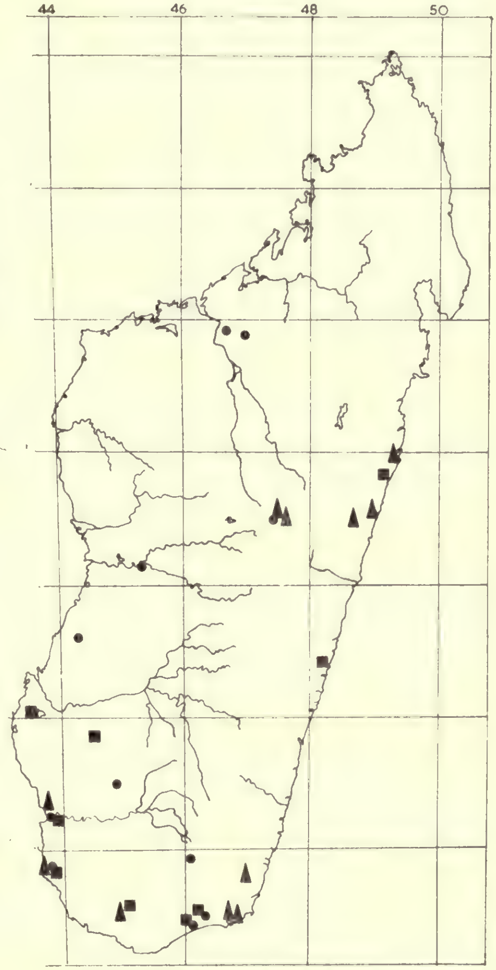

FIG. 21. Geographical distribution.
●—*Acrotylus patruelis* (Herrich-Schäffer, 1838).
■—*Acrotylus aberrans* Bruner, 1910.
▲—*Calephorus ornatus* (Walker, 1870).

Spermatheca with small, short apical diverticulum and large, short downcurved preapical diverticulum.

Length of body ♂ 11·8–14·9, ♀ 18·6–21·0 ; pronotum ♂ 2·6–3·2, ♀ 4·0–4·2 ; elytron ♂ 10·3–12·7, ♀ 14·0–15·5 ; hind femur ♂ 8·0–9·3, ♀ 10·6–11·7 mm.

Calephorus ornatus is very near to *Calephorus compressicornis* (Latreille, 1804). It differs by less widened antenna, by shorter fastigial foveolae, and more acute posterior margin of metazona of pronotum. It possibly belongs to the same species, representing only a geographical race.

Madagascar Centre : Tananarive, Tsimbazaza, 1 ♀. Ankadimanga, Manjakandriana, xii.1957, 1 ♀ (*J. Elie*).

Madagascar Est : Sakavondro, 40 m. vi.1957, 10 ♂, 9 ♀ (*A. Robinson*). Dct. Tamatave, Ambodihatafana, x.1958, 1 ♀. Perinet, 1 ♀. Station Agric. de Brickaville, 1 ♂, 5 ♀.

Madagascar Sud-Ouest : Lac Tsimanampetsotsa, Andranomby, 20.iv.1948, 1 ♂. Monombo, Tuléar, 10.v.1956, 4 ♂. Sakavondro, 225 m. forêt Isaka, 24.ii.1958, 1 ♂ (*P. Griveaud*). Ranomafana, Ifanadiana, 1 ♂.

Madagascar Sud : Fort Dauphin, iii.1960, 6 ♂, 4 ♀ (*R. Paulian*).

List of species recorded from Madagascar but not found in the material studied

Acrida turrita (Linnaeus, 1758)

This species was recorded from Madagascar by Saussure, 1899. It has never been recorded since and is probably the result of misidentification. Most probably it was *Acrida madecassa* Brancsik, 1893.

Aiolopus thalassinus (Fabricius, 1781)

This species was recorded from Madagascar by Krauss, 1877, Saussure, 1899 and Bruner, 1910. Much material of *Aiolopus* from Madagascar was studied, but all the specimens proved to be *Aiolopus rodericensis* (Butler, 1876). *Aiolopus thalassinus* was never encountered. These records were probably the results of misidentification.

Aiolopus sansibarus (Karsch, 1896)

The only record of this species from Madagascar is by Bruner, 1910. The species has never been recorded since and it is quite probable that this name is the result of misidentification.

Morphacris fasciata (Thunberg, 1815)

The only record for this species from Madagascar is by Saussure, 1884. Since then the species has never been recorded. The record is probably erroneous.

Pycnodictya galinieri (Reiche & Fairmaire, 1847)

The only existing record of this species from Madagascar is by Bruner, 1910. Most probably the species was confused with *Pycnocrania grandidieri* (Saussure, 1888).

Gastrimargus marmoratus (Thunberg, 1815)

This species was recorded from Madagascar by Saussure, 1884. It has not been recorded since. Probably this record ought to be referred to *Gastrimargus africanus* Sauss. which is abundant in Madagascar.

Acrotylus deustus (Thunberg, 1815)

The only existing record of this species from Madagascar is by Walker, 1870. It is most probable that the record is the result of misidentification, since this species has never been found in Madagascar since.

Acrotylus multispinosus Brancsik, 1893

This species is known only by the inadequate description. The type is lost. The species has never been recorded again. The identity of this species is unknown and cannot be established.

Calephorus compressicornis (Latreille, 1804)

This species was recorded from Madagascar by Bruner, 1910. It is most probable that the record ought to be referred to *Calephorus ornatus* (Walker, 1870). However, both species are so near that it is quite possible they represent only geographical races of the same species.

Brancsikellus gracilis (Brancsik, 1897)

This species is known only from a very inadequate description, and the type is lost. It is not possible to identify it now. I. Bolivar, 1914 placed it in the " group *Aiolopae*".

Truxalis nasuta (Linnaeus, 1758)

This species was recorded from Madagascar by Bruner, 1910 and by Sjöstedt, 1918. Both records are undoubtedly erroneous, since representatives of the genus *Truxalis* and of the subfamily *Truxalinae* have never been found in Madagascar. The records probably should be referred to the genus *Chromacrida*.

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University of Ghana, Accra

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A REVISION OF THE GENUS *CALLIPTAMUS* SERVILLE (ORTHOPTERA : ACRIDIDAE)

By N. D. JAGO

CONTENTS

SYNOPSIS

The trans-Palaearctic genus *Calliptamus* Serville is revised, thirteen species now being included in the genus. The genus consists of two main elements, a northern temperate group of four species and a southern temperate group of nine. The genus *Metromerus* Uvarov is synonymized with *Calliptamus*. A provisional key to genera in the sub-family Calliptaminae has been drawn up, together with keys to species and subspecies in the genus *Calliptamus*. Observations are given on polymorphism in the genus, geographical variation, and possible correlation of variation with climatic factors. Two species are newly described.

INTRODUCTION

Calliptamus Serville, 1831, with *Gryllus Locusta italicus* L., 1758 as type, originally contained two additional species now known as *Arcyptera fusca* (Pallas, 1773) and *Vilerna aeneo-oculata* (De Geer, 1773). In 1838 Serville added *C. ictericus* and *C. marginellus* to the genus, though omitting mention of *Acridium barbarum* Costa, 1836. His descriptions were based on Spanish material, and it is clear that he confused *C. italicus* (L.) (which does not occur south of the Pyrenees) with *C. wattenwylianus* (Pantel), "*ictericus*" being erected for *C. barbarus* (Costa) material collected near Madrid. Early in 1838, the genus under its emended form of *Caloptenus* (created by Burmeister), contained the type of this genus and four other species now known as *Melanoplus femur rubrum* (De Geer, 1773), *Melanoplus bivittatus* (Say, 1825), *Euryphymus haematopus* (L., 1758), and *Rachitopis melanoplus* (Burmeister, 1838). Later in 1838, Burmeister introduced *Caloptenus siculus*, clearly synonymous with *C. barbarus* (Costa). Wider geographical data were given by Fischer (1853), his genus including *Caloptenus siculus, barbarus, italicus,* and *ictericus*. *C. barbarus* he claimed intergraded with *italicus*, while the latter was described as possessing a variety *marginellus*. It may be noted that Serville suggested varietal status for *marginellus* when he described it in 1838, I. Bolivar (1876) later endorsing this view.

Walker (1870) described *Caloptenus discoidalis* as new, and placed *italicus* (L.) and *ictericus* Serville in *Caloptenus* : he probably confused his species with *barbarus* (Costa) and *wattenwylianus* (Pantel) as Serville had done earlier, since his " *italicus* " occurred in Syria and Israel, his " *ictericus* " in North Africa. The emended name *Calliptenus* was given to the genus by Stål (1873). The type of the genus and five other species were included, the modern *Sphodromerus serapis* (Serville, 1838), *Plegmatopterus irisus* (Serville, 1838), *Euryphymus haematopus* (L., 1758), *Calliptamicus semiroseus* (Serville, 1838), and *Aneuryphymus erythropus* (Thunberg, 1815). I. Bolivar (1876), writing on the Orthoptera of Spain and Portugal, mentioned *C. italicus* (L) and *C. ictericus* (Serville), the former probably being *C. wattenwylianus* (Pantel) and the latter *C. barbarus* (Costa). Since the name *C. ictericus* was also applied later to material of *C. wattenwylianus* (Pantel), e.g. by Brunner (1882), it is difficult to interpret Bolivar's species. Brunner, in 1882, started a trend by synonymizing all previously recognized species and subspecies under *C. italicus* (L.), his *Caloptenus brunneri* Stål later being made type for the genus *Paracaloptenus* I. Bolivar. As late as 1898 I. Bolivar still agreed with Brunner in giving *C. wattenwylianus* varietal status only.

Kirby (1890) clarified the correct generic synonymy, and fixed *C. italicus* (L.) as logotype. In 1902, Jacobsen & Bianchi put the genera *Sphodromerus*, *Calliptamus*, and *Paracaloptenus* into a group, the Calliptamini. *Caloptenus coelesyriensis* (Giglio-Tos, 1893) was added to *Calliptamus* by them, though *siculus* Burmeister and *wattenwylianus* (Pantel) retained their varietal status. To the varieties of *Caloptenus barbarus*, Vosseler added *var. deserticola* in 1902.

Kirby's catalogue of 1910 synonymized most of the post-Linnaean species under *Calliptamus italicus* (L.), six other species being included in the genus *Callipiamus* : *discoidalis* Walker, *marmarotus* Fischer-Waldheim, *cephalotes* Fischer-Waldheim, *vulcanius* Krauss, *tarsius* Fischer-Waldheim, and *scutifer* Walker. Of the first four, *vulcanius* was given its correct name of *C. plebeius* (Walker) in 1925, and the others synonymized under *C. barbarus* (Costa). *C. tarsius* and *C. scutifer* were eventually removed from the genus.

Recognition of *C. bimaculatus* Krauss, 1902 (now in the genus *Caloptenopsis*), *C. abbreviatus* Ikonnikov, 1913, and *C. okbaensis* Kheil, 1915, started the last phase in taxonomic development, in which the numbers of species and subspecies in the genus greatly increased. Uvarov (1922) still recognized only two species. Between 1928 and 1940, however, 8 new species and 4 subspecies appeared. In 1951, Ramme described *C. italicus insularis.*, *C. tenuicercis syriacus*, *C. tenuicercis aurantipes*, *C. barbarus pallidipes*, and *C. palaestinensis erythrocnemis*, Mařan naming *C. tenuicercis iracus* and Mishchenko *C. barbarus nanus*. Also in 1951 Mishchenko described two new subspecies of *Metromerus coelesyriensis* (Giglio-Tos) : *intricatus* and *hissaricus*. In 1952, *C. afghanus* Ramme and *C. barbarus pallidipes* f. *salina* Maran were described.

The basis of the following revision is a comparative study of the male phallic complex. This provides good species and subspecies characters. The components of the phallic complex can be seen in Text-figures 1 and 2, orientation *in situ* within the insect being demonstrated in Text-figure 2: J, p. 293.

The nomenclature of the phallic complex is largely that followed by Dirsh (1956)

(for key to abbreviations see Text-figure 1). Not all the phallic components are of taxonomic value. The epiphallus, while possessing characters of generic importance, can be very variable (see Text-figure 15: M, O, Q. p. 315). So too are the cingular rami (Text-figure 1g) and anterior expansions of the penis valves (Text-figure 1h). Most stability is found in penis and cingular valve morphology, to which all other characters (phallic or external) can be related. Within the genus aedeagal types fall into two groups :

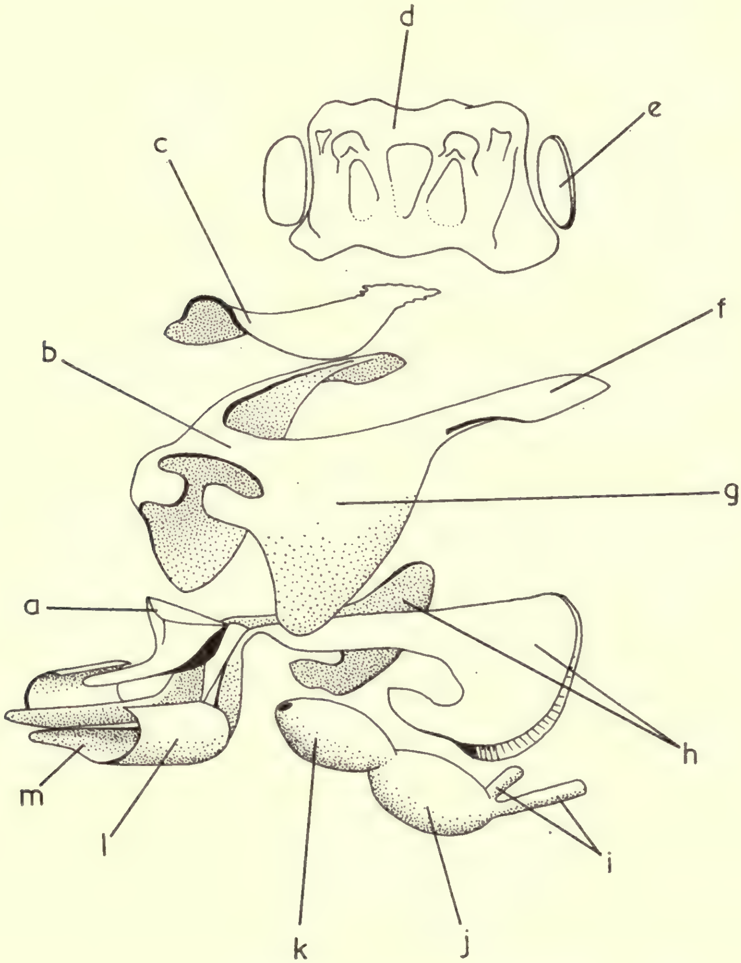

FIG. 1. Exploded generalized diagram of male genitalia in genus *Calliptamus* Serville. a. arch of cingulum and median dorsal cingular valve ; b. zygoma, a transverse dorsal part of cingulum to which arch of cingulum and cingular valve are joined by membrane ; c. dorsal part of ectophallic membrane ; d. epiphallus ; e. oval sclerites of epiphallus ; f. cingular apodeme ; g. ramus of cingulum ; h. internal anterior expansions of penis valves, for muscle attachment ; i. ejaculatory ducts ; j and k. endophallic sacs ; l. lateral appendices of penis valves ; m. apex of penis valve. The above letter key has been used throughout the paper for all phallic diagrams.

(i) Those with elongate blade-like penis valves, whose membranous lateral appendices curl upwards over the tongue-like cingular valve, e.g. *C. italicus* (L.) (Text-figure 10: C and D. p. 307). The group contains the northern temperate element of the genus, best adapted to cooler, wetter, boreal conditions. Of the four species in the group, *C. abbreviatus* Ikonnikov has probably evolved from *C. italicus* (L.) under isolation in the Far East and central Asia, while *C. turanicus* Tarbinsky has evolved from *C. wattenwylianus* (Pantel) when the two species were separated by the unfavourable semi-desert conditions which now prevail in the Middle East (Text-figures 6 and 7, pp. 301, 302).

(ii) Those in which the penis valves are blunter, often rugose and deeply pigmented, the lateral appendices of the penis valves merely abutting on the cingular valve laterally, the appendices being thickened and frequently auricular in shape. The cingular valve is broad and apically thickened, the posterior edge usually being straight in outline, e.g. *C. barbarus* (Costa) (Text-figure 25: C and F. p. 339). The group forms the southern temperate element of the genus, best adapted to warmer, drier, semi-desert or dry Mediterranean conditions. Of the nine species in the group, *C. barbarus* (Costa) has widest distribution, and has given rise to two island species (*C. madeirae* Uvarov and *C. plebeius* (Walker)), while three further species may have arisen from *C. barbarus* as a result of the isolation of elements during the last glacial expansion in Europe (*C. subalpinus* sp. n., *C. cyrenaicus* sp. n., and *C. siciliae* Ramme). *C. coelesyriensis* (Giglio-Tos), *C. tenuicercis* (Tarbinsky), and *C. balucha* Uvarov complete the group, *C. balucha* probably having evolved in the isolation of the Western Himalayas from elements of *C. tenuicercis*. All subspecies in the group seem to be centred on mountainous areas where a rigorous climate and isolation in a rugged topography have necessitated marked evolutionary change. Thus *C. barbarus palaestinensis* (Ramme) is centred on the mountain backbone of Lebanon and Israel, *C. balucha brachypterus* (Dirsh) on the higher valleys of the Hindu Kush, and *C. coelesyriensis hissaricus* Mishchenko on the Tien Shan and mountains of northern Afghanistan.

Phallic characters have been used for this group by Tarbinsky (1930), Silvestri (1934), Grassé & Hollande (1945), Chopard (1943), and Ramme (1951). Unfortunately they deal in each case except the last with only a small range of the distribution of each species.

MATERIAL

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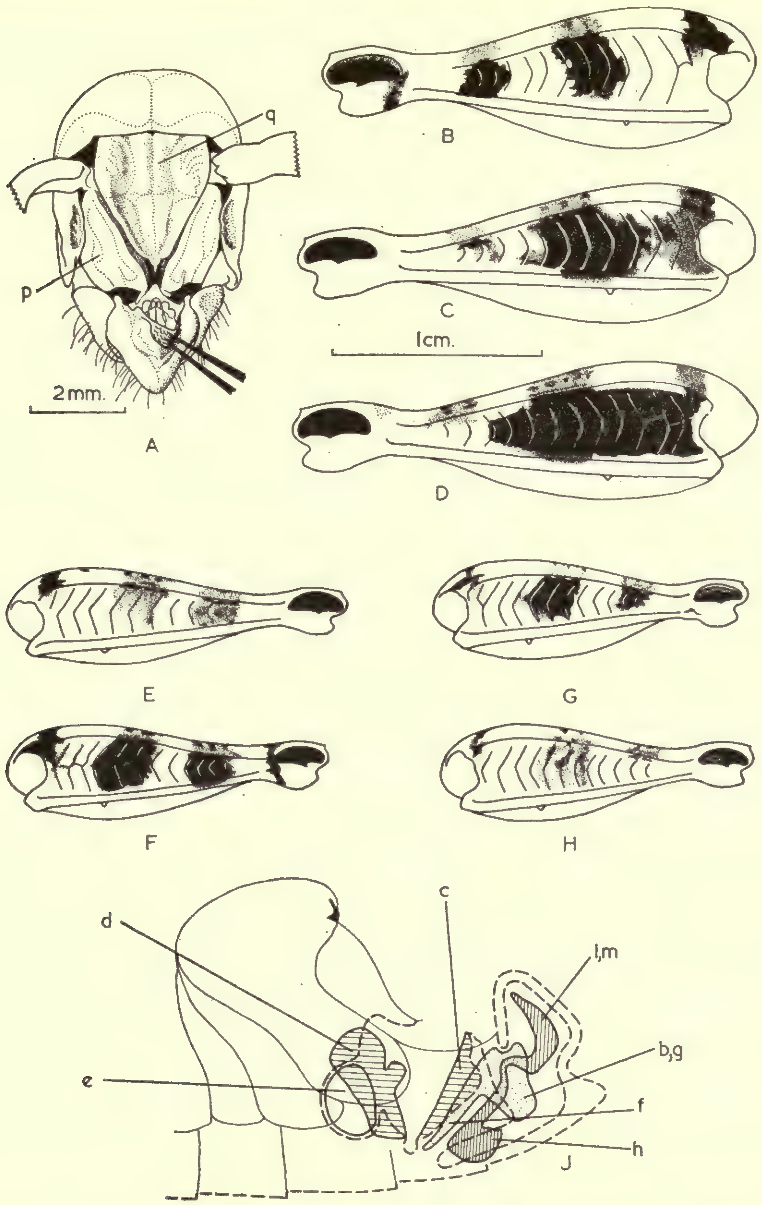

FIG. 2. A. Male genitalia of *C. wattenwylianus* (Pantel) *in situ* with ectophallic pocket drawn back revealing apices of penis valves. (q. supra-anal plate; p. triangular parameres each with a sensory style apically); B.–H. Inner surface of posterior femora in various specimens of *C. barbarus* (Costa) and *C. italicus* (L.): B–D. *C. barbarus palaestinensis* Ramme Israel, Jerusalem; F–G. *C. barbarus barbarus* (Costa) from Banyuls-sur-Mer, eastern Pyrenees, showing range of variation for comparison with typical specimen of *C. italicus* (L.) from the same area (E): J. A longitudinal section of male *Calliptamus* type male genitalia *in situ* (compare with Figure 1). Symbols as for fig. 1.

TREATMENT

Under each species type data and despository follow the name, while the diagnosis which follows the synonymy deals in turn with the morphology of the male phallic complex, cercus and tegmina, general colouring, posterior femoral and tibial colour, hind wing morphology and colour. Females are discussed separately and their morphology compared with that of the males. The wing vein nomenclature used is that of Ragge (1955). Measurements are given in millimetres throughout, the number of individuals measured, range and mean, being listed for males and females. The following measurements are used in this paper.

(i) Total length—distance from frons to apices of folded tegmina. This applies even in brachypterous forms.
(ii) Head width—horizontal distance across outside of compound eyes.
(iii) Femur length—distance from proximal end of posterior femur to tip of outer apical lobe at joint with tibia. The term " knee of posterior femur " refers to expanded distal portion.
(iv) Tegminal length—distance from intersection of costal border of tegmen with posterior edge of pronotum to apex of tegmen, wings and tegmina being folded.

Sections on distribution and material examined are followed by a discussion section, keys to subspecies being inserted where appropriate.

All material examined is represented by series or specimens in the collections of the British Museum (Natural History), unless otherwise stated. All types mentioned in the text were examined by the author, or, if the holotype was not available, representative valid paratype material was used.

Keys to species proved especially difficult for females, where colour characters were of necessity one of the main criteria for separation. Two keys are therefore included, and that to males should be used for diagnosis wherever possible. Isolated female material may be tentatively identified from the key (p. 310), which is geographically sub-divided.

Full details of material under "material examined" sections are available in the thesis held in the library of the University of London, Senate House, London, W.C.1.

Wherever the abbreviation *C.* is used it stands for *Calliptamus*. Other generic emendations or synonyms beginning with C are written in full.

Two references may sometimes be given under one name in the synonymy sections, e.g. see p. 333. The second, after a semi-colon, refers to an important subsequent reference to the earlier name.

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Key to the Genera of the Subfamily Calliptaminae

The eleven genera in the Calliptaminae are all related on epiphallic characters (Dirsh, 1956), and possess cerci modified in some degree as clasping organs. The genera can only be defined using a number of characters. Uvarov (1950) recognized the provisional nature of his key, and explained that the characters used were probably too arbitrary to be retained. Examination of *Caloptenopsis* I. Bolivar indicated that it is probably a compound of five generic units, at least one of which is inseparable from *Acorypha* Krauss.

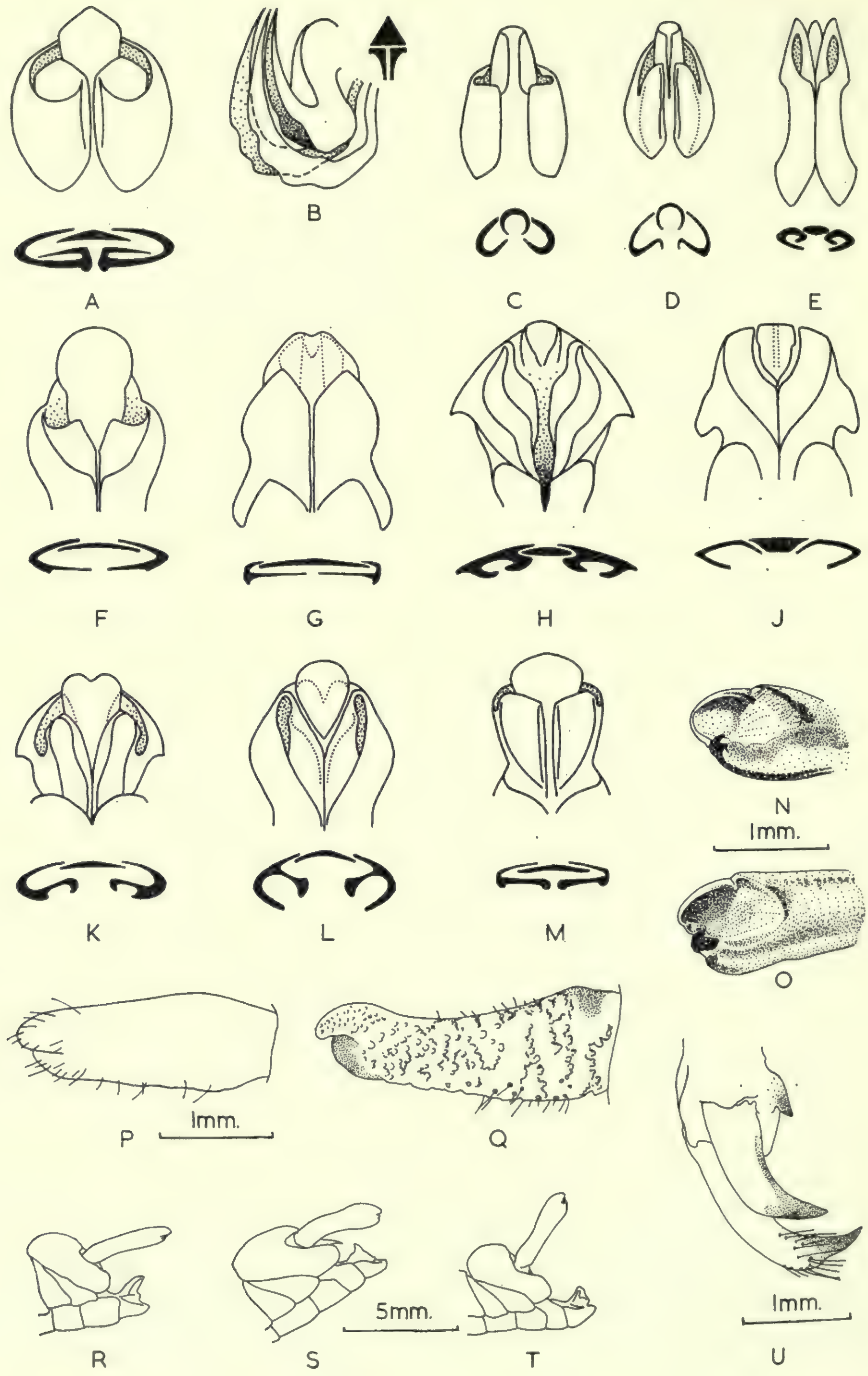
A brief review of generic characters follows :

(i) *Cercus*—weak and tapered, e.g. *Palaciosa* C. Bol. and *Indomerus* Uv. (Text-fig. 3 : P and Q), or powerful and tri- or bi-lobed, e.g. *Calliptamus* Serv. (Text-fig. 3 : O) ; usually bearing an inwardly directed hook apically (Text-fig. 3 : N and O). In *Palaciosa* weak with no such hook. In *Caloptenopsis* I. Bol., *Bothrocaracris* Uv., *Paracaloptenus* I. Bol., and *Acorypha* Kr., shorter than that in *Calliptamus* Serv., bilaterally greatly flattened, and broadly lobed apically. Ghanaian material of *Stobbea riggenbachi* Rme. shows a distinct trend towards formation of an apically tri-lobed type. The tendency is thus not confined only to *Calliptamus* Serv.

(ii) *Posterior tibial spurs*—in *Calliptamus* Serv. (Text-fig. 20 : E. p. 324), outermost and longer of inner pair is unmodified. *Caloptenopsis* I. Bol. and *Acorypha* Kr. show a tendency towards elongation of this spur, its tip finally becoming pre-apically placed behind a hirsute lobe (Text-fig. 3 : U, and Text-fig. 20 : F and G. p. 324). One *Acorypha* species in Ghana has both inner spurs modified. *Bothrocaracris* Uv., and to a lesser extent *Indomerus* Dirsh, show modified spurs. The character may not indicate phyletic relationship.

(iii) *Tegmina*—in *Calliptamus* Serv. all intermediates occur between a fully alate state and an extreme brachypterous condition (where tegmina become transformed into dorso-laterally situated scales. In contrast all *Paracaloptenus* I. Bol., *Palaciosa* C. Bol., *Indomerus* Dirsh, and *Peripolus* Mart. species are characterized by scale-like tegmina.

(iv) *Pronotum*—many *Caloptenopsis* species resemble *Calliptamus* Serv. in having a weakly developed median carina, and slight anterior convergence in lateral carinae (Text-fig. 19 : B–J. p. 322). Typical *Acorypha* Kr. species have strongly convergent lateral carinae and an acutely pointed median posterior border, many " *Caloptenopsis* " species unfortunately showing strong trends towards this type. *Bosumia* Rme. and *Brachyxenia* Kirby have lateral carinae almost obliterated, and a broad pronotum with moderate to heavy surface rugosity. *Peripolus* Mart. and *Paracaloptenus* I. Bol. have strongly tectiform pronota with smooth flat inter-carinal areas, distinct carinae, and a facies similar to that of the unrelated West African genus *Mazaea* Stål. Much apparent similarity may be due to convergent evolution.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U
1mm.

(v) *Male phallic complex*—if this complex organ can be taken as being a more reliable indicator of phyletic affinity, then *Brachyxenia* Kirby and *Peripolus* Mart. (Text.fig. 3 : C and D) show strong resemblances, as does *Indomerus* Dirsh, with *C. coelesyriensis hissaricus* (Mistsh.) (Text-fig. 3 : A, and 14 : B. p. 313). *Caloptenopsis* I. Bol. seems to be a compound genus, some groups of species resembling *Acorypha* type in phallic structure (see Text-fig. 3 : L, and Text-fig. 3 : E and G—J). *Palaciosa* C. Bol. is unique (Text-fig. 3 : B). It is of course difficult as yet to homologize parts in different penis valve systems.

The following key is based mainly on male facies.

1. Cingular valve with edges curled inwards forming a partly closed tube (Text-fig. 3 : C and D. p. 296) 2
–. Cingular valve flattish or triangular in cross section, not forming a tubular structure (Text-fig. 3 : A–B, E–M, and 10 : E–G. pp. 296 and 307) 3
2. Pronotum smooth and strongly tectiform with 3 distinct carinae. Hind femora slender. Tegmina forming dorso-laterally situated scales. Cerci apically bilobed—lower lobe longer than upper . . . . ***PERIPOLUS*** Martinez
–. Pronotum rugosely sculptured with almost obliterated lateral carinae. Hind femora toothed above, hairy below; very broad. Cerci bilobed : lobes roughly equal or upper longer than lower . . . . ***BRACHYXENIA*** Kirby
3. Lateral accessory processes of penis valves absent. Cingular and penis valves elongate, blade-like, and of same length. Cercus very weak ; apically bilobed (Text-fig. 3 : P. p. 296) . . . . ***PALACIOSA*** C. Bolivar
–. Lateral accessory processes of penis valves well developed. Cercus moderately to strongly developed. Bi- or trilobed apically 4
4. Vertex of head with two depressions, an anterior oval depression and a narrow interocular depression. Frons expanded anteriorly, when head viewed from a lateral aspect. Cercus bilobed apically with small ventral lobe similar to *Caloptenopsis*. Outermost of inner pair of posterior tibial spurs with pre-apical tooth (as in Text-fig. 20 : F. p. 324) . . . . ***BOTHROCARACRIS*** Uvarov
–. Vertex of head with single shallow ovate depression (especially in ♀) or a single interocular groove. Frons not unusually expanded anteriorly. Cercus bi- or trilobed apically. Posterior tibial spurs modified or normal 5
5. Cercus rugosely pitted on outer surface, rather weak and markedly tapered apically. Apex bilobed (Text-fig. 3 : Q. p. 296). Penis valves well developed (Text-fig. 3 : A. p. 296) but unlike most of genus *Calliptamus*, flattened into a plane parallel with that of cingular valve. Unlike *C. coelesyriensis hissaricus* (Mishch.) in having penis valves shorter than lateral accessory processes. Cingular valve narrower than distance between outer edges of penis valves . . . . . ***INDOMERUS*** Dirsh

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FIG. 3. A—M. Penis valves of representative species from genera in sub-family *Calliptaminae*. Below each penis apex (viewed from a postero-dorsal aspect except in B), is a transverse section through the valves to show relationships of penis and cingular valves :

A. *Indomerus* Dirsh ; B. *Palaciosa* C. Bolivar ; C. *Peripolus* Martinez ; D. *Brachyxenia* Kirby ; E and G–J. various at present placed in *Caloptenopsis* I. Bolivar ; F. *Sphodromerus* Stål ; K. *Paracaloptenus* I. Bolivar ; L. *Acorypha* Krauss ; M. *Sphodronotus* Uvarov. N and O. Inner apical surface of male cercus in *C. coelesyriensis* (Giglio–Tos) (N) and *C. italicus* (L.) (O). P and Q. Cerci of the genera *Palaciosa* C. Bolivar and *Indomerus* Dirsh respectively. R–T. Apical abdominal segments of males of *C. italicus* (L.), *C. wattenwylianus* (Pantel), and *C. barbarus* (Costa) respectively. U. Inner pair of posterior tibial spurs in a species of *Caloptenopsis* I. Bolivar showing an intermediate stage in development of a pre-apical spur tooth (cf. Fig. 20: F and G which show extreme examples).

–. Cercus not rugosely pitted on outer surface, relatively smooth, upper and lower margins only slightly convergent apically or parallel. Penis valves developed or undeveloped 6

6. Apex of cercus trilobed, median lobe bearing an inwardly directed copulatory hook. If cercus bilobed then :
   (i) outermost of inner pair of posterior tibial spurs unmodified, not strongly hirsute and with no pre-apical point (Text-fig. 20 : E. p. 324) ;
   (ii) penis valves well developed being erect and as well developed as lateral accessory processes, not being merely an auricular fold of posterior inner edge of lateral accessory processes (Text-figs. 10 and 25. pp. 307 and 339) ;
   (iii) lateral carinae of pronotum never strongly narrowed in anterior third. Lateral carinae of pronotum never obsolete, usually clearly defined ;
   (iv) if cercus bilobed apically lower lobe never less than one third depth of upper lobe **_CALLIPTAMUS_** Serville

–. Apex of cercus always bilobed 7

7. Lateral accessory processes of each penis valve auricular on posterior face . . 8

–. Lateral accessory processes exposing a flat face posteriorly, their planes being same as that of cingular valve 11

8. Lateral pronotal carinae obsolete. Posterior margin of pronotum very acutely produced . . . . **_BOSUMIA_** Ramme

–. Lateral pronotal carinae clear, or only partly obsolete 9

9. Pronotum markedly tectiform. Posterior tibial spurs never modified. Tegmina form dorso-lateral scales. Wings absent . . . . . **_PARACALOPTENUS_** I. Bolivar

–. Pronotum not markedly tectiform. If tegmina reduced to scales then posterior tibial spur elongate and modified 10

10. Upper inner area of posterior femur almost vertical. Dorsal carina, as seen from above, very close to inner side of femur. Disruptive band of light colour across outer surface of posterior femur, just proximal to knee, matching with a dark band across folded tegmina, about 1/3 from their tips. Eyes light in colour, never with pronounced eyestripes, though in life with structural iridescence indicating eyestripes. Frontal ridge above antennal sockets, widely expanded and flat. **_STOBBEA_** Ramme

–. Upper inner area of posterior femur clearly sloping outwards. Dorsal carina, as seen from above, not markedly close to inner side of femur, often lying on mid-line. No disruptive femoral band of light colour as described above. Eyes often dark monochromatic, or with pronounced eyestripes. Frontal ridge above antennal sockets slightly expanded, and usually concave **_ACORYPHA_** Karuss and **_CALOPTENOPSIS_** I. Bolivar
   (There seems to be no satisfactory means of separating these two genera)

11. Femur of second pair of legs with only upper furrow distinct on outer side ; lower carina of posterior femora widened beyond middle. Hind tibia with 6 (seldom 7) external spines . . . . **_SPHODROMERUS_** Stål

–. Femur of second pair of legs with 2 distinct furrows on outer side ; lower carina of posterior femora not widened beyond middle. Hind tibia with 9 (seldom 8) external spines . . . . **_SPHODRONOTUS_** Uvarov

CALLIPTAMUS Serville, 1831

Calliptamus Serville, 1831, *Ann. Sci. nat.* (*Zool.*), **22** : 284. Type species *Calliptamus italicus* (Linnaeus, 1758). [Neotype in British Museum.]

Caloptenus Burmeister, 1838, *Handbuch der Entomologie,* **2** (2) : 637. Emendation for *Calliptamus* Serv., 1831.

Calliptenus Stål, 1873, *Recensio Orthopterorum,* **1** : 38, 72, 73. Emendation for *Calliptamus* Serv., 1831.

Metromerus Uvarov, 1938, *Ann. Mag. nat. Hist.* (11) **1** : 379. Type species *Metromerus coelesyriensis* (Giglio-Tos, 1893). [Type in Turin Museum.]

DIAGNOSIS ♂. 1. (*a*) Aedeagus composed of an upper cingular valve (Text-fig. 1 : a, and Text-fig. 10 : E and G, a. p. 307), and pair of penis valves (Text-fig. 1 : m, and 10 : E–G, m. p. 307). Penis valves always with lateral accessory processes (Text-fig. 1 : 1). (*b*) Cingular valve tongue-like with membranous lateral processes of penis valves (e.g. *C. italicus* (L.), Text-fig. 10 : C, D, F. p. 307), or thickened and straight apically (Text-fig. 10 : E. p. 307, and Text-fig. 25 : C and F. p. 339) with penis valves which project beyond tip of cingular valve, their lateral accessory processes merely abutting on cingular valve laterally, not encircling it. Penis valves of latter type orientated in a plane at right angles to that of cingular valve, or if broad and lobate and lying in same plane as cingular valve, (Text-fig. 16 : B. p. 317) then cingular valve itself membranous (cf. *Indomerus* Dirsh, couplet 5 in key p. 297, and Text-fig. 3 : A. p. 296).

(*c*) Penis valves either elongate, blade-like, and pointed (Text-fig. 10 : C, m. p. 307, and Text-fig. 13 : A, B, m. p. 311) or blunt and more or less thickened, with slightly to well developed flanges along their upper outer edges, and thickened rugose lateral accessory processes (Text-fig. 25 : F, p. 339). Lateral accessory processes of latter type may be auricular, and shield weak penis valves (Text-fig. 15 : F. p. 315).

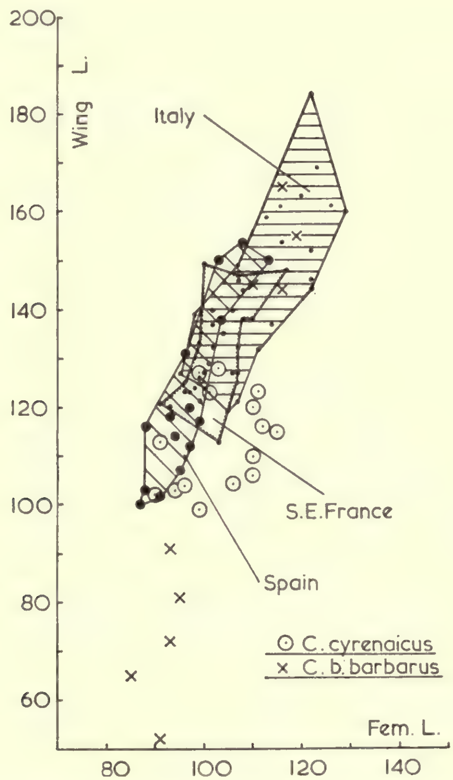


FIG. 4. A scatter diagram for the ratio of femur length to wing length in males of *C. barbarus* (Costa) and *C. cyrenaicus* sp. n., from various North African and European populations. *C. barbarus barbarus* (Costa) from the Iberian peninsula, and *C. cyrenaicus* sp. n. show close affinities, while the scatter diagrams shift towards higher values as one moves eastwards in southern Europe.

2. Cerci usually tri-lobed apically, upper lobe broad and laminar, lower lobes smaller, middle lobe bearing an inwardly directed hook (Text-fig. 3 : O. p. 296). Lower pair of lobes may however show progressive fusion giving a bi-lobed apex; invariably so in *C. coelesyriensis* (Giglio-Tos) except in its subsp. *hissaricus* (Mishchenko) (Text-fig. 17 : M. p. 319).

3. Inner pair of posterior tibial spurs unmodified, outer spur of pair never strongly elongate or hirsute (Text-fig. 20 : E. p. 324).

4. Pronotal carinae distinct. Lateral carinae may fade just before reaching posterior edge of pronotum (Text-fig. 19 : B–J. p. 322). Pronotal sides almost vertical (cf. *Bosumia* Ramme and *Brachyxenia* Kirby), except in upper quarter; smooth whitish nodular area often present towards upper anterior corner (Text-fig. 20 : D. p. 324) (as in many *Caloptenopsis* spp.).

♀. No known diagnostic characters peculiar to this sex. Females very uniform morphologically throughout related genera in the sub-family. Cerci unmodified.

Discussion.—Synonymy of *Metromerus* Uvarov with *Calliptamus* Serville is

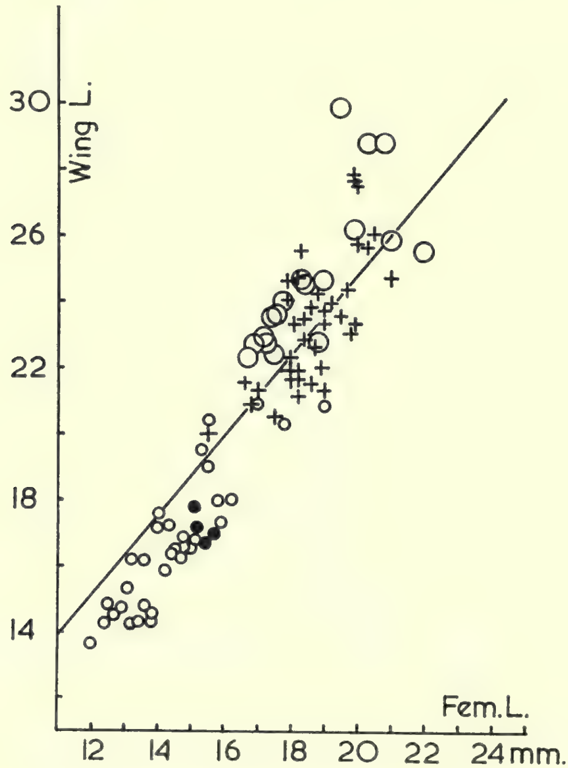


Fig. 5. A graph of wing length against femur length for females of *C. tenuicercis* Tarb., showing the regression line for points plotted ($y = 1{\cdot}15\ x - 1{\cdot}37$, correlation coefficient $r = 0{\cdot}7$). Small circles represent material from Turkey (Ankara, Mersin, and Adana), U.S.S.R. (Azerbaydzhan, Daghestan, Tbilisi, and Yerevan), and Iran (Gandzha, Tehrān area); crosses represent material from Turkey (Urfa), Jordan (El Boweida, Wadi Zarqa, El Salt, and Shueib, and U.S.S.R. (Leninakan and Aresh). Large circles represent material from Israel (Negev), Jordan (Khor Kabid), Iran (Ahvāz), while solid dots represent material from Lebanon. Points with the lowest values for the ratio appear to belong to populations found in areas of highest rainfall (10 in. to 25 in. mean annual rainfall), the smallest coordinate values from areas with a mean annual rainfall as small as 4·9 in.

considered justified because the characters used to separate the genera are applicable to either. Indeed Uvarov found the genus difficult to define when he revised it in 1943.

(i) Cercus morphology of *Metromerus* Uvarov is closely approached by many specimens of *C. subalpinus*, *C. wattenwylianus* (Text-figure 24: H, J, N. p. 336), *C. turanicus*, and *C. siciliae* (Text-figure 24: XVIII. p. 336), as well as montane forms of C. barbarus (Text-fig. 24 : XI, XIV. p. 336). Moreover the subspecies *C. coelesyriensis hissaricus* often has a trilobed cercus apex.

(ii) The male genitalia show only specific differences, i.e. no more different than *C. italicus* is from *C. barbarus*.

(iii) Both *C. wattenwylianus* and *C. coelesyriensis* have melanic colour forms.

(iv) The lateral pronotal carinae do not differ markedly from those of *Calliptamus*, a point indicated by Uvarov when he erected the genus.

Examination of the type of *Calliptamus mus* I. Bolivar shows that it was misidentified as a member of the genus *Calliptamus* and should be placed in the genus *Sphodromerus* Stål.

Polymorphism and Geographical Variation. The components of polymorphism in the genus can be illustrated by five main characters :

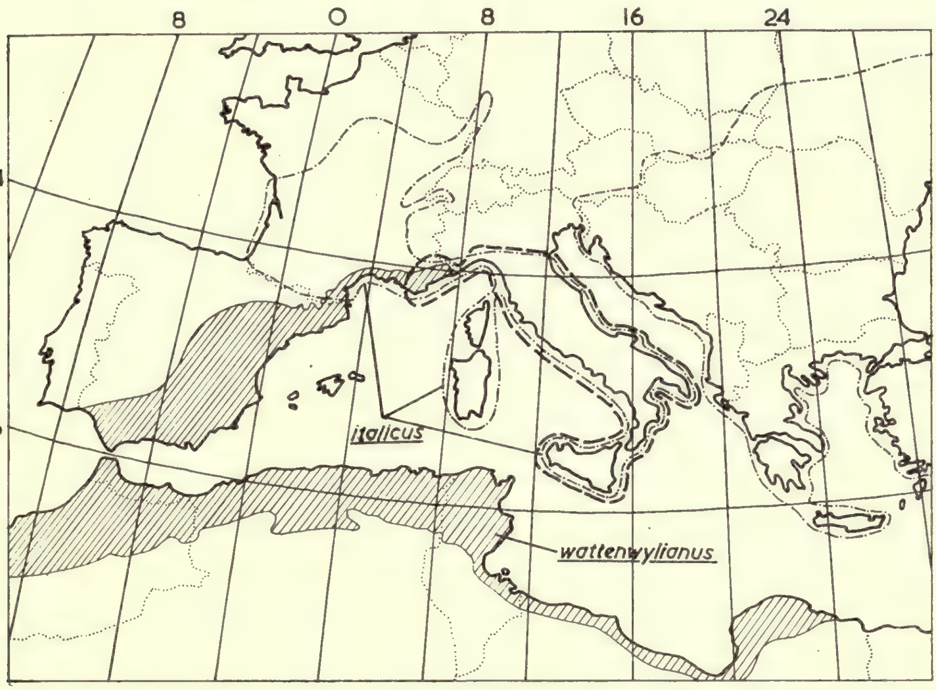


Fig. 6. The distribution in southern Europe and North Africa of *C. italicus* (L.) (dotted and broken line), *C. wattenwylianus* (Pant.) (oblique shading) ; *C. subalpinus* sp. n. and *C. siciliae* Rme. stat. n. (broken line).

(i) Black spots on inner side of posterior femur. Three in number (Text-figure, 2 : B, E, F, G. p. 293) but subject to various degrees of reduction (Text-figure 2 : H. p. 293), or expansion and fusion (Text-figure 2 : C, D. p. 293). Contraction in size, though not with a loss of intensity, takes place in populations subject to a wet, cold climate. Expansion and fusion occurs under the opposite extreme in climatic conditions, namely dry and hot. Thus populations from arid semi-desert may possess femora of the type shown in Text-figure 2 : D. In the case of specimens from cold dry environments, such as the uplands of central Iran, the size of the middle spot may remain the same but the pigment becomes very diffuse, often only resulting in a greyness of the pink background colour, e.g. *C. coelesyriensis hissaricus* (Text-figure 17 : T. p. 319), *C. barbarus*, and *C. balucha*.

Especially well developed in *C. wattenwylianus* is the tendency for a diffuse black pigment to be laid down throughout the pink or orange background colour of the posterior femur and tibia. This occurs in the south of its range of distribution in all the drier, more arid conditions of North Africa.

(ii) Background colour of posterior femora and tibiae. Occasionally where the melanic femoral spots disappear the black pigment can be replaced by pink, e.g. *C. coelesyriensis* (Text-figure 17 : P, Q). Apart from this facies, however, boreal and montane forms, living in wetter colder environments, have crimson as background colour. This may be deep or faint, the intensity of pigmentation being greatest at the extreme of coldness and wetness. Boreal species, e.g. *C. abbreviatus*, will all have this facies ; those like *C. italicus* which enter more southerly environments will show

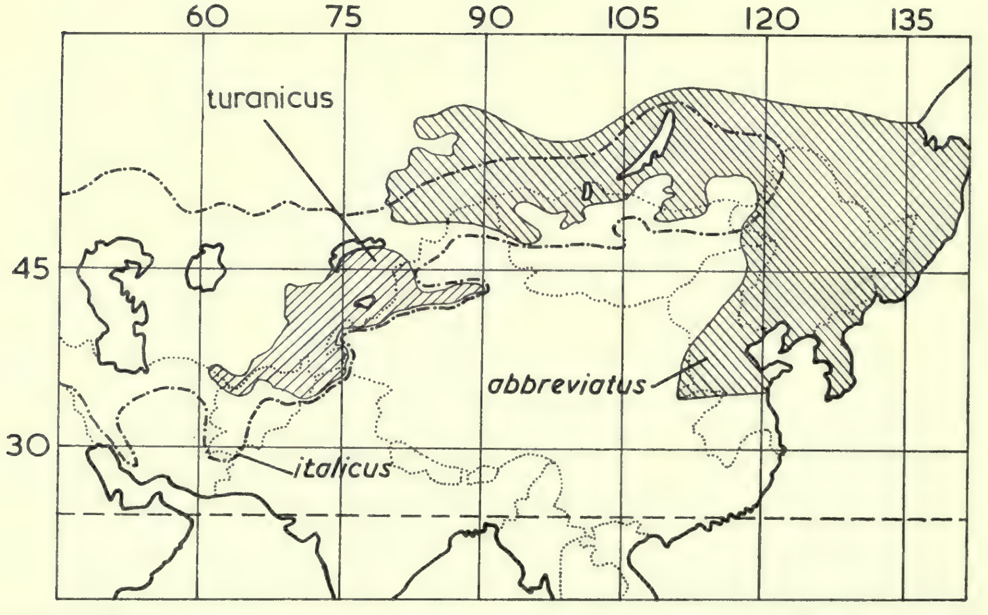


FIG. 7. *C. turanicus* Tarb., *C. abbreviatus* Ikonn., and *C. italicus* (L.) ; distribution in Middle East and Asia.

a fading of the red coloration, e.g. in Crete and the Greek Islands, and in Afghanistan, *C. italicus* may show little or no pink background pigment.

The antithesis to the red colouring is a yellow pigment. Incorporated with the red component, it produces an orange colour. Overlaid with a diffuse black pigment it becomes greyish green in appearance. *C. tenuicercis*, *C. barbarus*, and *C. barbarus palaestinensis* all show the orange form, and in addition may also show yellow-legged forms in which the red colour component has disappeared (e.g. *C. barbarus palaestinensis* is entirely yellow-legged, except in its abrupt entry into the Lebanon ranges where it becomes red-legged). Populations of *C. barbarus* in southern Greece, e.g. Mt. Parnassos and Xilókastron, show orange-red legs in the males while sympatric females are yellow-legged. Also, while in Cyprus only one specimen of *C. barbarus* from Mt. Troodos was orange-legged (the rest being yellow-legged), mixed populations of orange and yellow-legged individuals were usual in areas such as south eastern Turkey, and northern Syria (Text-figure 22 : A. p. 330). It is quite clear that warm, dry conditions favour the formation of orange and yellow-legged polymorphs. The latter are general in areas affected by maritime conditions, such as the extreme north of Morocco, or the Greek archipelago, or in cold dry upland areas which experience very hot summer conditions, e.g. the Ankara plateau in Turkey, or central Israel.

In montane or extreme boreal populations, the hind wing pigmentation may be completely lost. This is fixed as a species character in *C. abbreviatus*.

(iii) Tegminal length. Montane and boreal forms tend to be short-winged, while the warm and often semi-desert conditions of the southern Palaearctic region, or inland steppes exposed to dry continental climates, show populations in which the wings and tegmina are well developed, and often have apices which surpass the knees of the posterior femora when the tegmina are folded.

In *C. barbarus* in Morocco, *C. balucha brachypterus* in the Hindu Kush, and *C. italicus* in Afghanistan, tegmina may become so reduced as to be useless for flight. *C. cyrenaicus*, *C. subalpinus* and *C. abbreviatus*, are all species with tegmina of medium length, the apices of which never surpass the apices of the posterior femora. *C. italicus*, *C. turanicus*, *C. barbarus* and *C. tenuicercis*, are all species showing every intermediate between elongate wings and tegmina like those of *C. subalpinus*.

(iv) General body colouring. While members of the " *italicus* " group (see p. 320) tend to show little polymorphism in this respect (*C. wattenwylianus* being a notable exception), the " *barbarus* " group tends to show marked general body colour polymorphism. *C. cyrenaicus*, a species of the semi-desert fringe of Libya in North Africa, shows this exceptionally well (see pronota, Text-figure 19 : B–J. p. 322). The pronotum is not the only part of the exoskeleton to vary in colour, e.g. the head, Text-figure 20 : A–C, p. 324, corresponding to pronotal types J, B, and F of Text-figure 19 respectively. Most specimens of *C. italicus*, *C. abbreviatus*, and northerly populations of other species, will have pronotal types D–F. The uniform, pale coloured body colour, represented by pronota G–J, is found in semi-desert forms of *C. italicus* and *C. coelesyriensis*, and many individuals from southerly populations of *C. barbarus* and *C. tenuicercis*. The most extreme type of polymorph is *f. marginellus*, represented by pronotum A, in which a dark, often brown body colour, is contrasted with 2 light cream stripes on the vertex which pass along the inner edge of each lateral pronotal

carina, and may or may not be continued as a light line along veins Cu_2 and 1A of the tegmina. Most members of the "*italicus*" group show this form to some degree, but although the northerly elements of the "*barbarus*" group are often almost completely uniform in general body markings, southerly species and populations show the "*marginellus*" form as a dominant and striking polymorph. The various polymorphic forms grade into one another and are not clearly demarcated.

(v) Cercus apex. Only in *C. coelesyriensis coelesyriensis* is the bilobed cercus apex constant. In *C. coelesyriensis hissaricus* the middle and lower lobes are often distinct. In contrast, montane or boreal populations of *C. barbarus, C. subalpinus. C. wattenwylianus, C. turanicus, C. balucha,* and *C. siciliae,* show a tendency for fusion of the lower pair of apical lobes, finally producing a single lobe. Populations from semi-desert areas have a tendency to have clearly demarcated lobes.

When describing species, montane, boreal, or semi-desert forms may be referred to. Their characteristics can be deduced from above, if it is also remembered that boreal and montane forms are always smaller than semi-desert individuals of the same group.

There seems to be some evidence that the colour polymorphs and tegminal variability in *Calliptamus* may not be rigidly fixed genetically, but may be linked closely with the climatic environment. Thus the isoclines for the ratio femur length/tegminal

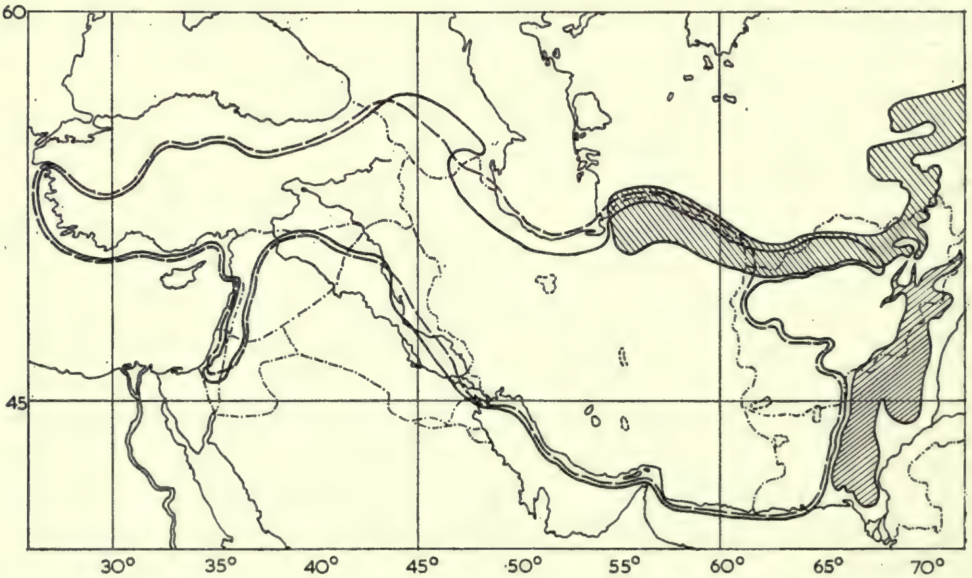
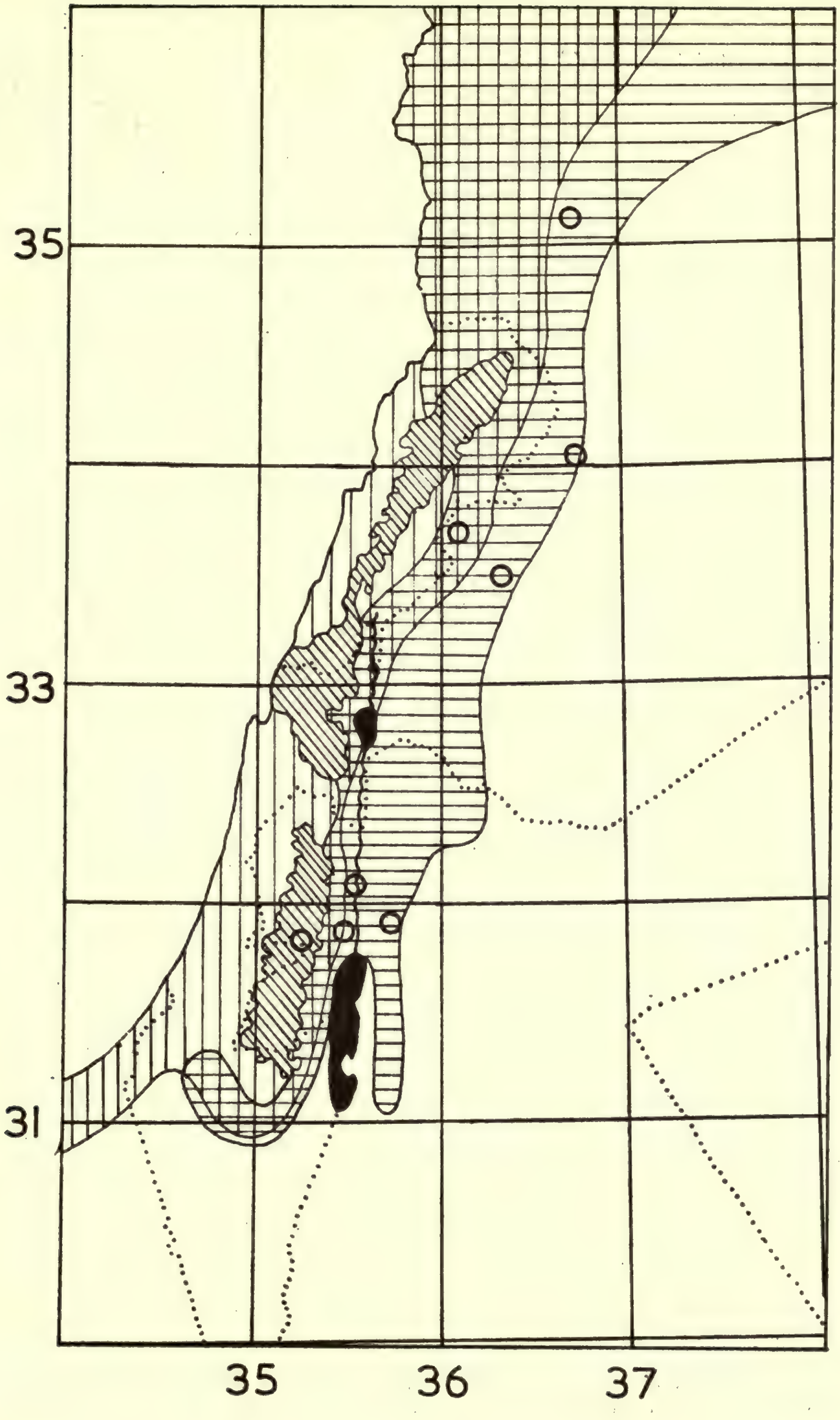


FIG. 8. The distribution in the Middle East, Turkey, and U.S.S.R. of *C. coelesyriensis coelesyriensis* (G.–T.) (broken line), *C. coelesyriensis hissaricus* (Mishch.) (northern obliquely shaded portion), *C. balucha* Uv. (southern obliquely shaded portion), and *C. tenuicercis* Tarb. (continuous line).

FIG. 9. The distribution in Jordan rift valley area of *C. barbarus barbarus* (Costa) (vertical shading), *C. barbarus palaestinensis* Rme stat. n. (diagonal shading), *C. tenuicercis* Tarb. (horizontal shading), and *C. coelesyriensis* (G.–T.) (small circles).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length in males of *C. barbarus* (Text-figure 11, p. 309) and for the ratio femur length/head width in females of *C. tenuicercis* bear a striking parallel to the isohyets for the Middle East (Text-figure 21, p. 329). Femoral colour polymorphs also seem to be correlated with these isohyets. Thus *C. tenuicercis*, whose range seems confined within an area whose rainfall is less than 25 in. per annum (cf. Text-figure 9, p. 305, and Text-figure 21, p. 329), produces the colour variety f. *aurantipes* (pale orange tibiae) in the higher rainfall areas it enters in southern Turkey and western Syria. Comparison of *C. barbarus* and *C. tenuicercis* leg colour polymorph distribution (Text-figures 22 : A, and 22 : B, p. 330) with Text-figure 21, shows that the orange femoral coloration is confined to areas with a rainfall of less than 25 in. per annum in the former species, and less than 15 in. in the latter. The two species therefore appear to react to the environment differently, the orange-legged facies in *C. tenuicercis* being less tolerant to increased rainfall than that of *C. barbarus*. If the wing length is plotted against femur length in females of *C. tenuicercis* (Text-figure 5, p. 300), a regression line can be drawn (suggesting continuity of this variant across the apparent discontinuity of the leg colour variants), the values at the lower end of the graph corresponding to the areas of highest rainfall (10 in.–25 in. mean annual rainfall per annum), those at the upper end to areas with low rainfall (often as small as 4·9 in.). Unfortunately the climatic data available refer to macroclimatic conditions, so that conclusions must be tentative. It is also very unlikely that the variants described will correlate simply with any one climatic factor.

Key to Species

Males

1. Membrane covering penis valves externally produced into a long, decurved, backwardly directed pocket, i.e. with same configuration as penis valves inside (Text-fig. 3 : R. p. 296 and Text-fig. 10 : C, D, and F. p. 307). Hind wings never colourless, even if reduced . . . . ***italicus*** (L.) (p. 316)

–. Pocket covering penis vavles not so elongated or shaped. Usually bluntly produced and backwardly directed (Text-fig. 3 : T. p. 296), but may be erect, short, and pointed (Text-fig. 3 : S. p. 296) 2

2. Inner face of posterior femora without any markings between upper and lower inner carinae ; this area pale body colour, without any trace of pink or orange pigment 3

–. A single black spot, or two to three separate spots, between upper and lower inner carinae of posterior femora 4

3. Pocket covering penis valves with outline shown in Text-fig. 3 : S. p. 296, orientation being vertically or slightly forwardly directed. Only occasionally with median hooked apical cercus lobe wholly fused with ventral lobe, but always rather weakly developed. Rami of cingulum convergent ventrally (Text-fig. 13 : B. p. 311). Male phallic complex, Text-fig. 13 : A, F. p. 311 . . ***turanicus*** Tarbinsky (p. 325)

–. Pocket covering penis valves bluntly produced in a postero-dorsal direction (Text-fig. 3 : T. p. 296). Cerci invariably with median lobe fused into lower lobe, upper and lower lobes thus being almost equal to each other (Text-fig. 3 : N. p. 296, and Text-fig. 17 : L, N. and O). Male phallic complex Text-fig. 16. p. 317
coelesyriensis (Giglio–Tos) (p. 343)

4. Posterior femora yellow on inner face 5

–. Posterior femora dull crimson, orange, or red, between upper and lower carinae, intensity of colour varying from pale to deep 6

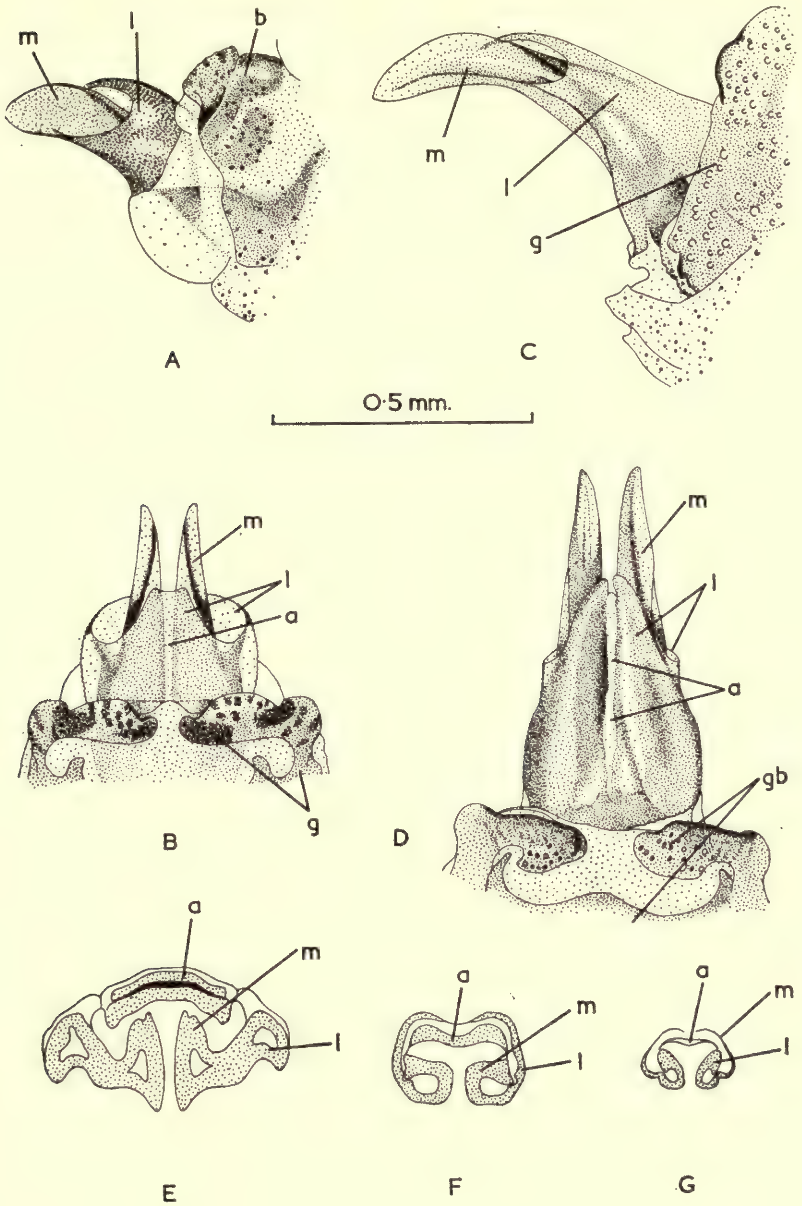


FIG. 10. A and C. Lateral aspects of penis valve in *C. abbreviatus* Ikonnikov and *C. italicus* (L.) respectively; B and D. Dorsal aspects of penis valves in *C. abbreviatus* Ikonnikov and *C. italicus* (L.) respectively; E–G. Transverse sections through valves of penis in *C. barbarus* (Costa), *C. italicus* (L.), and *C. wattenwylianus* (Pantel) respectively.

5. Inner side of posterior femora filled or partly filled, between upper and lower inner carinae, by a solid black blotch, or separate spots which show various degrees of fusion (anterior pair first—as in Text-fig. 2 : B–D). Lateral appendices of penis valves bluntly pointed as seen from above ; valves strongly developed though may be pointed with triangular dorso-lateral expansions (Text-fig. 25 :, A–D, F, J. p. 339) . . . . ***barbarus*** (Costa) (p. 327)

–. Inner side of posterior femora normally with 3 separate black spots but occasionally, when sympatric with orange-legged form of *barbarus* (Costa), has a single solid inner femoral blotch. Lateral appendices of penis valves auricular. Penis valves weak (Text-fig. 15 : F, m. p. 315) . . . . . . ***tenuicercis*** Tarbinsky (p. 340)

6. Cercus with very large laminar dorsal apical lobe (Text-fig. 24 : XIX. p. 336) ; lower lobes weak and divergent. Wings smoky. Male phallus, Text-fig. 26 : A, B, C. p. 346 . . . . ***plebeius*** (Walker) (p. 347)

–. Cercus without such a large laminar dorsal lobe ; lower lobes may be fused but not attenuate 7

7. Hind wings usually pink ; only colourless in forms with very short tegmina from montane localities, in which wings no longer functional for flight 10

–. Hind wings colourless, when folded not surpassing knees of posterior femora, but fully functional for flight 8

8. Cerci with lower apical lobes separate ; median lobe distinctly longer than lower lobe. Male phallus, Text-fig. 10 : A, B. p. 307. . . . ***abbreviatus*** Ikonnikov (p. 326)

–. Cerci with median apical lobe more or less fused to lower lobe, equal to it in length or even shorter (Text-fig. 24 : XVII. p. 336) 9

9. Widest part of penis valves (as seen from above) clear of posterior edge of cingular valve. Sicily only (Text-fig. 24 : XVIII). . . . . ***siciliae*** Ramme (p. 340)

–. Widest part of penis valves (as seen from above) level with posterior edge of cingular valve (Text-fig. 25 : E. p. 339) . . . . . . ***subalpinus*** sp. n. (p. 338)

10. Inner side of posterior femora orange. Inner femoral blotch filling, or almost filling, inner area 11

–. Inner side of posterior femora red, scarlet, or dark ruby ; varying intensity of colour. Inner femoral spots fused or separate 12

11. Posterior end of inner femoral spot showing at least some trace of orange at its margin ***barbarus*** (Costa) (p. 327)

—. Posterior end of inner femoral blotch without any trace of orange at its margin ***tenuicercis*** Tarbinsky (p. 340)

12. Three separate inner femoral spots (sometimes pale) 13

—. Anterior spots on inner side of femora fused, or one blotch present of smaller or larger size, diffuse or clearly demarcated 20

13. Vertical knob-like thickening on posterior median edge of dorsal ectophallic plate. Penis valves typically lying in same plane as cingular valve. Cerci usually bilobed apically (Text-fig. 16 : C, D. p. 317) . . ***coelesyriensis*** (Giglio–Tos) (p. 343)

—. Posterior margin of dorsal ectophallic plate laminar (Text-fig. 1, p. 291). Cerci variable apically 14

14. Inner side of posterior femora with large diffuse median blotch, general colour surrounding it being smokey ruby-red (appearing dull mauve). Tendency to be moderately or very brachypterous (then non-functional for flight). Folded tegmina with apices never surpassing knees of posterior femora. Cerci less than 3·5 times longer than broad (see *tenuicercis* Tarbinsky, couplets 5 and 11, where cerci at least 4 times longer than broad) . . . . ***balucha*** Uvarov (p. 342)

—. Inner side of posterior femora, if approaching colour described above, with 3 separate spots of roughly equal size. Never with non-functional hind wings 15

15. Aedeagus with pointed, non-auricular, lateral accessory penis valve processes (Text-fig. 13 : B, C. p. 311) curling upwards and lying above cingular valve. Pocket

covering penis valves short, pointed, and almost erect (Text-fig. 3 : S. p. 296). Apices of folded tegmina never surpassing knees of posterior femora
wattenwylianus (Pantel) (p. 320)

—. Lateral accessory processes of penis valves blunt and darkly sclerotized or auricular. Pocket covering penis valves blunt; directed diagonally backwards (Text- fig. 3 : T. p. 296). Folded tegmina with apices often surpassing knees of posterior femora 16

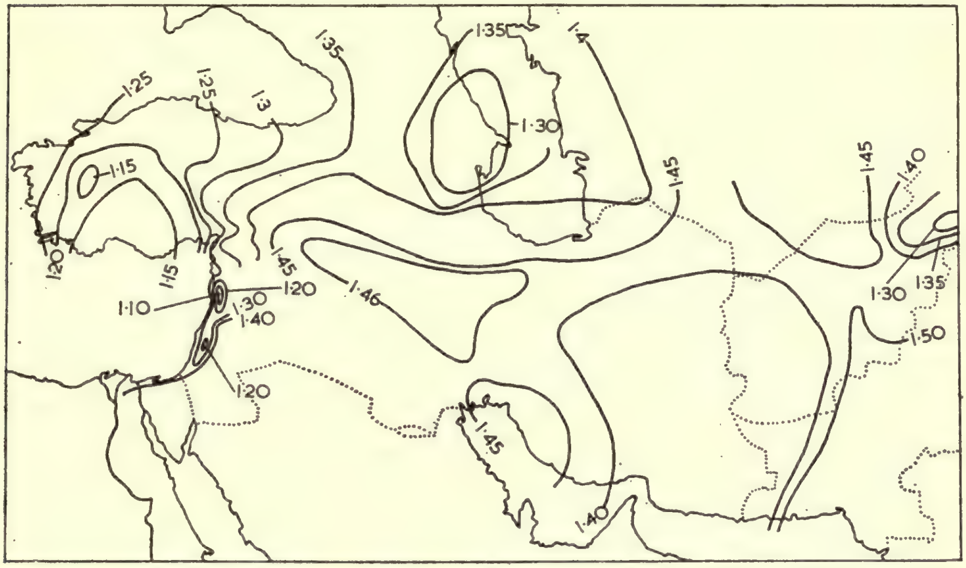


FIG. 11. *C. barbarus* (Costa); isoclines of femur length to tegminal length ratio for males from Middle East and Central Asia.

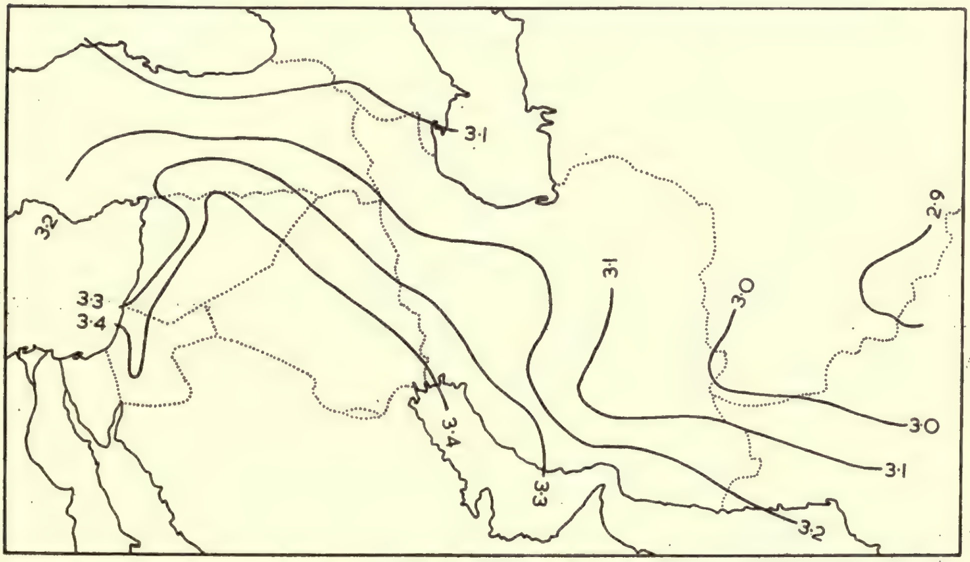


FIG. 12. *C. tenuicercis* Tarb.; isoclines of femur length to head width ratio for females from Middle East and Central Asia.

16. Inner side of posterior femora dull pale pink ; tibiae pale to dark orange-yellow
tenuicercis* f. *aurantipes Ramme (p. 306)
—. Inner side of posterior femora dull ruby-red, posterior tibiae crimson or dull ruby-red 17
17. Folded wings with apices not reaching level of tips of posterior femora. Median and lower lobes of cercus tip always intimately fused to each other, median lobe equal to or even shorter than lower 18
—. Wings not always as short as above, often when folded with apices surpassing knees of posterior femora. Median and lower lobes of cercus apex usually unfused, median lobe longer than ventral lobe. Penis valves boldly sclerotized, not greatly tapered or out-curved apically (Text-fig. 25 : A–D and G. p. 339) 19
18. Penis valves small, usually tapered and slightly outcurved apically. SE. France and Italian peninsula . . . . ***subalpinus*** sp. n. (p. 338)
—. Penis valves small, roundly truncate apically. Not noticeably outcurved (Text-fig. 25 : K. p. 339). Sicily . . . . ***siciliae*** Ramme (p. 340)
19. Cingular valve, as seen from above, extending well beyond a line drawn between apices of lateral appendices of penis valves (Text-fig. 25 : G. p. 339). Folded tegmina with apices never surpassing knees of posterior femora, and tapered apically. Cyrenaica . . . . ***cyrenaicus*** sp. n. (p. 335)
—. Cingular valve apex, as seen from above, level with a line drawn between apices of lateral appendices of penis valves (Text-fig. 20 : A and B. p. 324) Apices of folded tegmina often surpass knees of posterior femora. (Never sympatric with *cyrenaicus* except as orange-legged form with solid inner black femoral markings)
barbarus (Costa) (p. 327)
20. Inner femoral spots fused to form a single blotch lying between upper and lower inner carinae 21
—. Only anterior pair of spots fused . . . . . . ***barbarus*** (Costa) (p. 327)
21. Lateral carinae of pronotum without any trace of convergence in metazone. Male penis valves weak, not extending far beyond cingular valve, as viewed dorsally. Lateral appendices of penis valves rather auricular (reminiscent of *tenuicercis*), whole structure recalling a large *C. subalpinus* (Text-fig. 26 : D. p. 346). Cingulum, at its dorso-posterior edge, forming 2 gently down-sloping lobes ***madeirae*** Uvarov (p. 347)
—. Lateral carinae of pronotum usually convergent in metazone. Male penis valves strongly sclerotized, extending well beyond cingular valve as seen from above. Lateral expansions of penis valves not auricular. Cingulum vertical behind its dorso-posterior edge . . . . ***barbarus*** (Costa) (p. 327)

Females

(Provisional key)

Because of the morphological uniformity among females in this genus, the following key has been sub-divided geographically as follows :

A. Southern Europe (excluding U.S.S.R.)
B. North Africa
C. Turkey, U.S.S.R., the Middle and Far East.

A. Southern Europe (excluding U.S.S.R.)

1. Hind wings colourless 7
–. Hind wings infused with pink 2
2. Inner side of posterior femora pale body colour or yellow 3
–. Posterior femora red, orange-red, or dull ruby-red on inner side 4

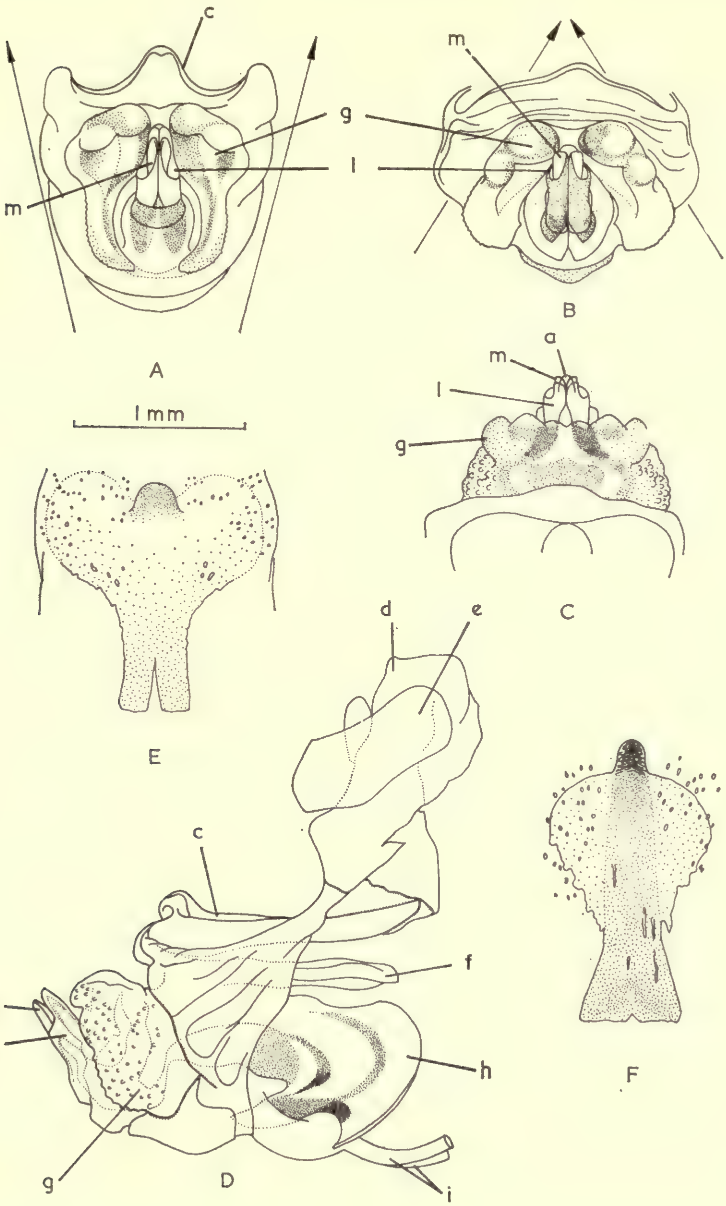


FIG. 13. A. and B. Postero-dorsal aspect of phallic complex of *C. turanicus* Tarbinsky and *C. wattenwylianus* (Pantel) respectively: C. Dorsal aspect of aedeagal apex in *C. wattenwylianus* (Pantel): D. Lateral aspect of whole of phallic complex in *C. wattenwylianus* (Pantel): E and F. Dorsal ectophallic plate of *C. wattenwylianus* (Pantel) and *C. turanicus* Tarbinsky respectively. (The arrows in A and B indicate upward divergence or upward convergence of the cingular rami in the phallic complex of each species, this being one of the main diagnostic characters.)

3. Three separate spots on inner side of femora. Spots often faint or almost absent from inter-carinal area (Text-fig. 20 : H and K). Tegminal apices never surpassing knees of folded posterior femora. Tegmina usually markedly tapered apically **wattenwylianus** (Pantel) (p. 320)
–. Single black femoral blotch between upper and lower inner carinae of posterior femora (Text-fig. 2 : D. p. 293). Tegminal apices usually surpassing knees of folded posterior femora, or level with them. Tegmina not markedly tapered apically **barbarus** (Costa) (p. 327)
4. Tegminal apices clearly surpassed by knees of folded posterior femora. Tegmina tapered in apical 2/3 5
–. Tegminal apices surpassing knees of folded posterior femora, or if falling short of latter, then doing so by only a very small margin 6
5. Large forms (total length 21·6–41·9 mm.). Distribution southern and eastern Spain, southern France. Not occurring east of French Maritime Alps. **wattenwylianus** (Pantel) (p. 320)
–. Small forms (total length 20·6–28·6 mm.). Distribution Italy, from Ligurian Alps to Sicily ; also in SE. France (Maritime Alps) 7
6. Inner femoral spots separate. Usually equal in size, often faintly developed, only just crossing upper inner carina (Text-fig. 2 : E. p. 293) . . **italicus** (L.) (p. 316)
–. Median inner femoral spot usually bigger than other two. If faintly pigmented however, very similar to more darkly pigmented forms of *italicus*. Separable in such cases only by a study of males from same locality (*italicus* has longer tegmina) . . . . **barbarus** (Costa) (p. 327)
7. Range in France and Italian peninsula . . . . **subalpinus** sp. n. (p. 338)
–. Sicilian species only . . . . **siciliae** Ramme (p. 340)

B. North Africa

1. Wings and tegmina very short, never extending further than middle of folded posterior femora . . . . **barbarus** (Costa) (p. 327)
–. Tegminal apices surpassing middle of folded posterior femora 2
2. Inner side of hind femora yellow or orange with black markings. Three black spots, sometimes fused . . . . **barbarus** (Costa) (p. 327)
–. Inner side of posterior femora red, dull ruby-red, or greyish pink 3
3. Bulky insects. Colours not contrasting. Melanic forms common. Tegmina often markedly tapered in apical 2/3. Head 5·0–7·1 mm., femur length 16·0–25·0 mm., tegminal length 16·3–31·5 mm. . . . . . **wattenwylianus** (Pantel) (p. 320)
–. Not conspicuously bulky. Often brightly coloured with "*marginellus*" form in evidence. No melanic forms. Tegmina only markedly tapered in apical 2/3 in *cyrenaicus* sp. n. Head width 4·75–6·0 mm., femur length 14·5–19·2 mm., tegminal length 15·0–21·0 mm. . **barbarus** (Costa) (p. 327) or **cyrenaicus** sp. n. (p. 335) (Separable on distribution or by males)

C. Middle East, U.S.S.R., Far East

1. Hind wings colourless, when folded never surpassing knees of folded posterior femora **abbreviatus** Ikonnikov (p. 326)
–. Hind wings pink. Often when folded surpassing knees of folded posterior femora . 2
2. Inner side of posterior femora unmarked between upper and lower inner carinae, this area being dull pink or body colour 3
–. Inner side of posterior femora with at least one darker or blackish marking . . 5
3. Large insects. Head width 6·3–7·1 mm.; inner side of posterior femora dull pink or body colour . . . . **turanicus** Tarbinsky (p. 325)

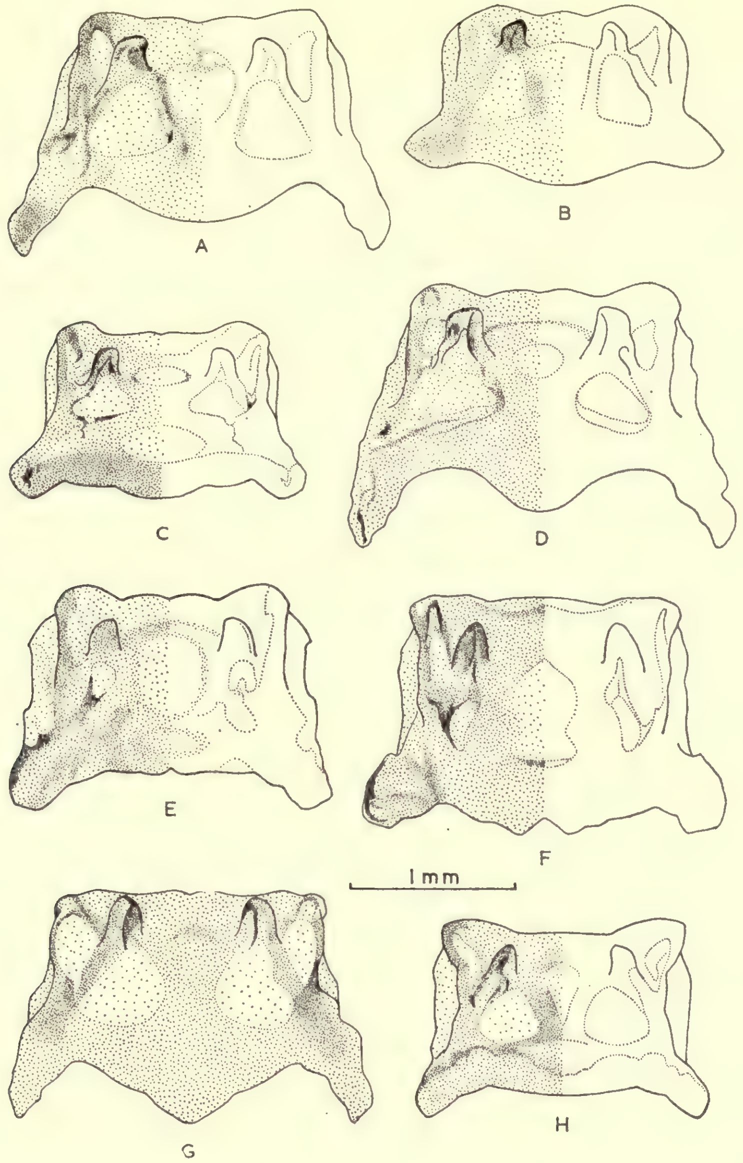


FIG. 14. Epiphalli: A, B, D, and G. *C. coelesyriensis* (Giglio–Tos) from: A. U.S.S.R., Armeniya S.S.R., pr. Megri; B. Turkey, Isparta prov., Dedeğol Dağ mt., Sütcüler; C. Iran, Haftom prov., Lār; G. (*C. coelesyriensis hissaricus* (Mishchenko)) Afghanistan, Badakhshan prov., Senna, 1,800 m.; C. *C. balucha* Uvarov from West Pakistan, Chitral reg., Chitral, 2,300 m.; E and H. *C. wattenwylianus* (Pantel) from E. France, Pyrénées–Orientales, intermediate to type found in North Africa. H. France, Var, typical of type found in south-eastern France. F. *C. turanicus* Tarbinsky from: U.S.S.R., Kazakhstan S.S.R., Yuzhno–Kazakhstanskaya Obl.

–. Smaller insects. Head width 4·0–6·0 mm. 4

4. Tegminal apices falling well short of knees of folded posterior femora. Tegmina speckled with small flecks of darker colour. Inner side of posterior femora dull grey-pink . . . . ***coelesyriensis*** (Giglio–Tos) (p. 343)

–. Tegminal apices level with knees of folded posterior femora, or surpassing them. Tegmina immaculate. Inner side of posterior femora pale body colour ***italicus*** (L.) (p. 316) (buff desert form)

5. Posterior tibiae yellow or orange 6

–. Posterior tibiae red, or crimson, or dull pink 11

6. Tibiae orange 7

–. Tibiae yellow 8

7. Solid inner femoral blotch on posterior femora (often extending below lower inner carina) with orange pigment just posterior to it . . ***barbarus*** (Costa) (p. 327)

–. As above, but blotch may be faint No trace of orange pigment posterior to black mark or blotch . . . . ***tenuicercis*** Tarbinsky (p. 340)

8. Inner side of posterior femora with solid inner blotch ***tenuicercis*** Tarbinsky (p. 340) or ***barbarus*** (Costa) (p. 327) (In southern Dead Sea valley and Negeb desert : divided on distribution, i.e. Text-fig. 9 (p. 305), or by association with males.)

–. Inner femoral spots with anterior pair fused, or all separate, or clear evidence (if in one continuous irregular blotch) of tripartite origin 9

9. All inner femoral spots clearly separated 10

–. At least anterior pair of spots fused ***tenuicercis*** Tarbinsky (p. 340) and ***barbarus*** (Costa) (p. 327) (Inseparable except on distribution, i.e. *tenuicercis* with these facies in northern Syria and SE. Turkey ; *barbarus* in Israel and Transjordan ; or by association with males.)

10. Head width 3·9–5·0 mm. Small insects. Central and southern Turkey ***tenuicercis*** Tarbinsky (p. 340)

—. Head width 5·0–6·4 mm. Larger insects. Israel and western Lebanon ***barbarus*** (Costa) (p. 327)

11. Inner side of posterior femora dull greyish pink. Inner femoral spot thus diffuse. Often showing extreme brachypterism . . . . . ***balucha*** Uvarov (p. 342)

—. Inner side of posterior femora with three clearly separate spots, though sometimes faint. Femora and tibiae never dull greyish pink, nor with large diffuse inner spot. Not showing extreme brachypterism 12

12. Completely black insects . . . . . . ***coelesyriensis*** (Giglio–Tos) (p. 343)

—. Buff, brownish, or greyish brown spotted insects 13

13. Tegmina creamy buff. Very finely peppered with small dark spots. Inner side of femora with three spots, often faint (Text-fig. 17 : S. p. 319) ***coelesyriensis*** (Giglio–Tos) (p. 343)

—. Tegmina dark brownish grey. Coarse spots or markings often orientated into transverse bands across them 14

14. Inner femoral spots extending only a short way below upper inner carina of posterior femora. Hind legs dull pink or dull mauve. Wings and tegmina well developed (except in Afghanistan where populations with short tegmina occur, i.e. knees of folded posterior femora surpass apices of folded tegmina, latter tapering in apical 2/3) ***italicus*** (L.) (p. 316)

—. Inner femoral spots larger and clearly defined, extending at least to middle of inner femoral area. Hind legs dull mauve to bright crimson 15

15. Posterior tibiae and inner side of femora dull to bright crimson, though this colour may disappear leaving almost all inner femoral area same colour as body. ***barbarus*** (Costa) (p. 327)

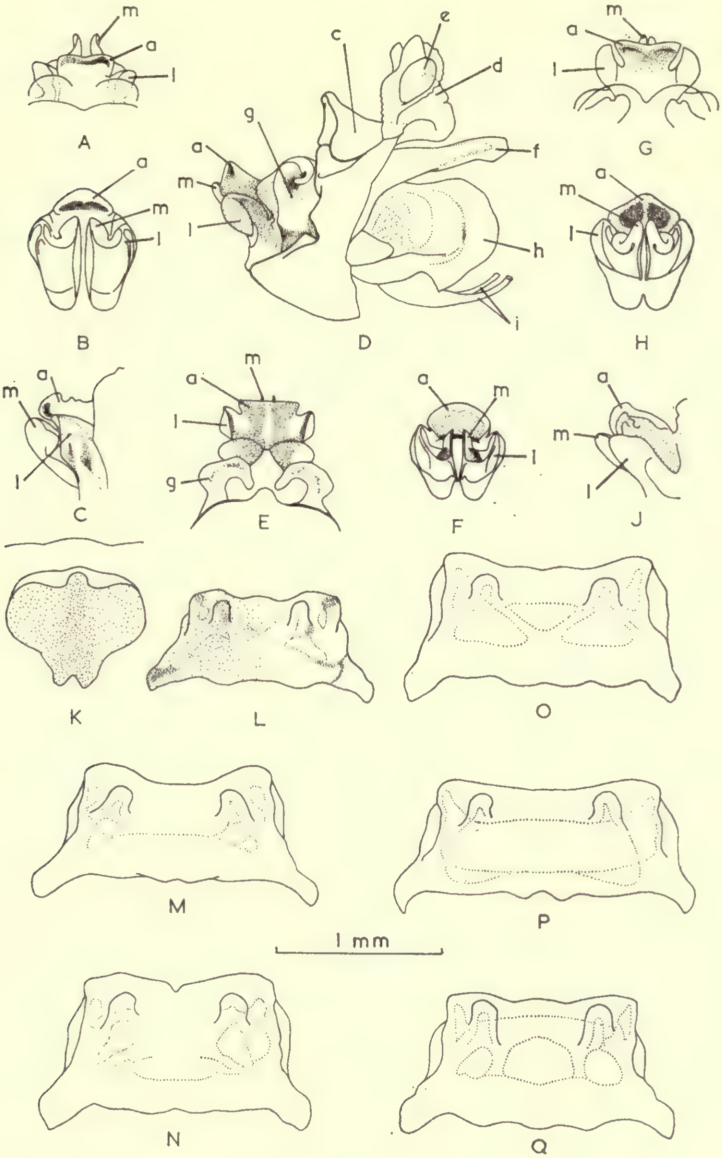


FIG. 15. Phallic complex of *C. tenuicercis* Tarbinsky, (D–F., K–M., and O–Q.), and *C. balucha* Uvarov (A–C., G–J, and N). (*a*) *C. tenuicercis* Tarbinsky : D. Lateral aspect entire male phallic complex (material from Turkey, near Ankara). E. and F. Dorsal and posterior aspects respectively of apex of valves in D. K. Dorsal ectophallic plate. L–M. and O–Q. Epiphalli from : L. Turkey, Ankara. M, O, and Q. Jordan, El Ghor valley, Jerash Rd., Wadi Zarqa. (*b*) *C. balucha* Uvarov : A–C. Dorsal, posterior and lateral aspects of tip of penis in subspecies *brachypterus* (Dirsh) from Chitral. G–J. Dorsal, posterior, and lateral aspects of tip of penis in nominate subspecies from West Pakistan, Baluchistan reg., Ziarat. N. Epiphallus of nominate subspecies.

(Lebanon, S. and W. Turkey, Iranian Azerbaidjan, U.S.S.R. bordering Black Sea, S. Caspian, etc.)

—. Posterior tibiae and inner side of femora mauve or dull pale ruby. Colour not intense **coelesyriensis** (Giglio–Tos) (p. 343)
(Turkish upland form)

Calliptamus italicus (Linnaeus, 1758)

Gryllus Locusta italicus Linnaeus, 1758, *Systema Naturae*, 10th edn.: 432. [Neotype ♂, Italy, Basilicata reg., Venosa, 420 m., 30.ix.1937, (*F. E. Zeuner*). Brit. Mus. (nat. Hist.) (subject to ratification by the International Commission on Zoological Nomenclature)].

Calliptamus italicus grandis Ramme, 1927, *Eos*, **3** : 166. [Holotype ♀, Italy, Sicilia I., Fontana Murata, 17.vii.1924, (*Ramme-Richter*).] **Syn. n.**

Calliptamus italicus reductus Ramme, 1930, *Mitt. zool. Mus. Berl.*, **16** : 214. [Holotype ♂, U.S.S.R., Kazakhstan S.S.R., Turkestan, Kazamuk Alai, 2850 m., 5.viii.1889, (*Conradt*).] **Syn. n.**

Calliptamus italicus insularis Ramme, 1951, *Mitt. zool. Mus. Berl.*, **27** : 308. [Holotype ♂, Greece, Páros I., viii.1925 (*A. Schultz*).] **Syn. n.**

Calliptamus afghanus Ramme, 1952, *Vidensk. Medd. dansk Naturh. Foren.* Kbh., **114** : 200 [Holotype ♂, Afghanistan, Faran and Chalchansur prov., Farah, 18.vi.1948, (*Haavlov, N.*).] **Syn. n.**

[Last four holotypes in Zoologisches Museum of Humbolt-Universität, Berlin.]

Diagnosis ♂. 1. Aedeagus (Text-fig. 10 : C, D. p. 307), long and decurved. Penis valves elongate and blade-like. Lateral processes of penis valves (Text-fig. 10 : D, l. p. 307) with their pointed apices curling up and over bases of decurved penis valves to form accessory stylets. Genitalia show greatest affinity with *C. abbreviatus*, *C. wattenwylianus*; and *C. turanicus*, differing from the first in having penis valves almost twice as long (cf. Text-fig. 10 : A and B. p. 307), and from last two in not having cingular valve, and lateral accessory processes of penis valves roughly same length (Text-fig. 13 : C and D. p. 311). Axis of aedeagus directed, *in situ*, upwards and backwards, valves enclosed by digitiform pocket in ectophallic membrane (Text-fig. 3 : S. p. 296). Cingular valve membranous, elongate, intimately attached to dorsally curled parts of lateral accessory valves (Text-fig. 10 : D, a. p.307). Posterior margin of dorsal ectophallic membrane plate laminar.

2. Cercus usually with all three apical lobes well developed and unfused (like Text-fig. 17 : H. p. 319). Cercus like that of many *C. barbarus* and *C. tenuicercis*.

3. Tegmina usually well developed, when folded extending beyond knees of folded posterior femora. Occasionally abrupt shortening of tegmina occurs, tegmina then tapering in their apical 2/3 (montane forms).

4. General coloration dark, except in very dry, hot regions, where light buff specimens occur (pronotal type G, Text-fig. 19. p. 322). Pronotum usually similar to F, Text-fig. 19. p. 322. Colour variation less than *C. barbarus* ; extreme " *marginellus* " variety never occurs (Text-fig. 19 : B. p. 322 ; and p. 303).

5. Posterior femora internally with 3 dull brown or blackish spots which are always separate (Text-fig. 2 : E. p. 293). Median and posterior spots equal in size, often extending only a short way below upper inner carina of femur. Confusable with *C. barbarus* in montane areas, since *barbarus* may have similar reduction and concentration of femoral spots (see Text-fig. 2 : H. p. 293). Populations of dry steppe often have almost immaculate pale cream inner femoral area (like *C. turanicus*).

6. Posterior tibiae invariably some shade of dull ruby-red, black pigment sometimes giving a mauve effect. Inner side of femora usually weakly pigmented with pink along and adjacent to lower inner carina.

7. Hind wings always with some trace of pink spreading across anal fan from wing base.

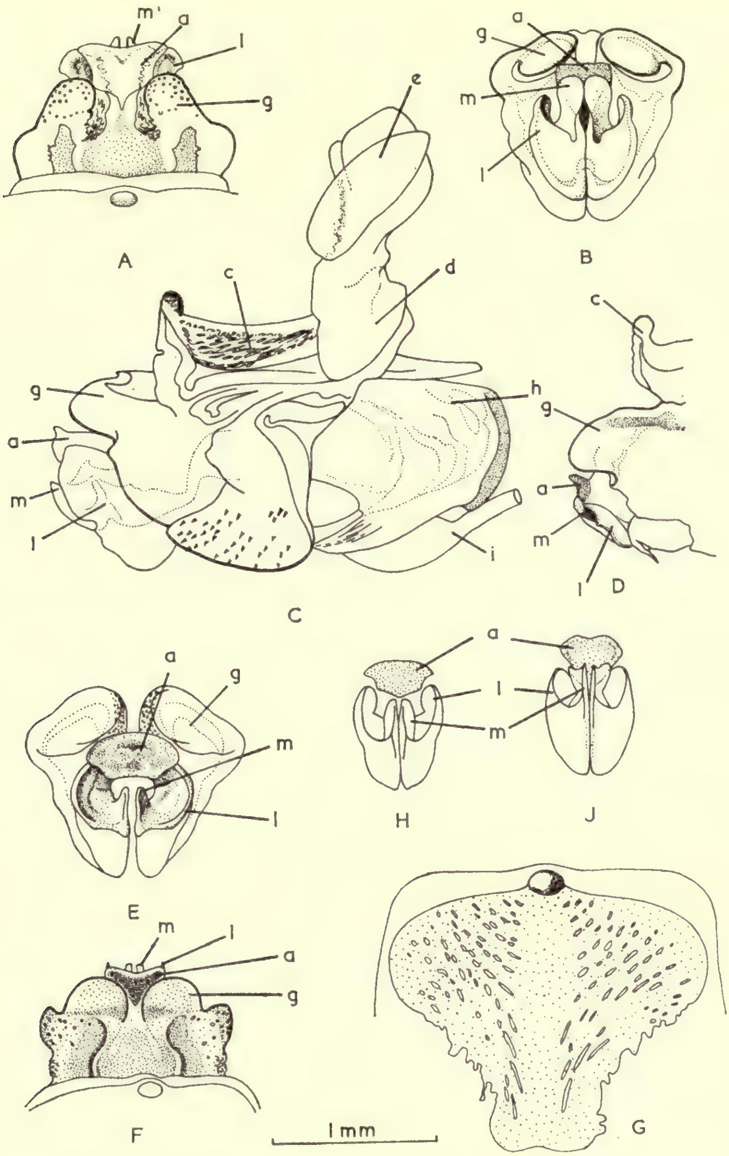


FIG. 16. Phallic complex of *C. coelesyriensis* (Giglio-Tos): A, C, E, and G. from Iran, Lār—typical of semi-desert populations. A. Dorsal aspect of tip of phallic complex showing penis valves. C. Lateral aspect of entire phallic complex. E. Posterior aspect of apex of phallic complex. G. Dorsal ectophallic membrane plate. B, D, H, J, and F. Phallic complex of *C. coelesyriensis hissaricus* (Mishchenko): B, D, and F. Posterior, lateral, and dorsal aspects of apical part of penis complex in material from Afghanistan, Badakhshan reg., Senna. H and J. Posterior aspects of intermediate penis types from zone of contact with nominate subspecies, Iran, Dovvom prov., Shahrud.

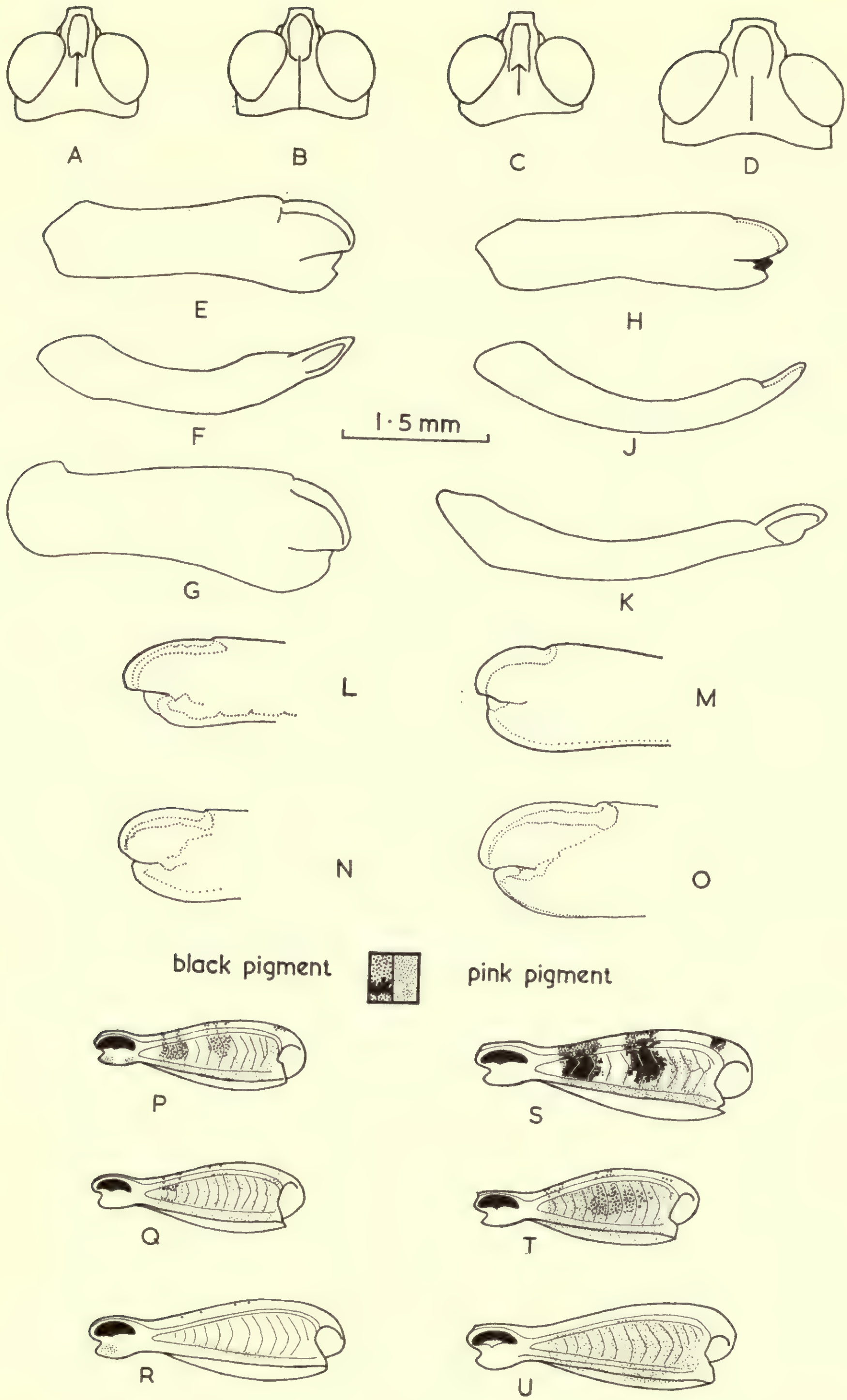
♀. Often very difficult to differentiate from *C. barbarus*, *C. wattenwylianus*, and *C. subalpinus* (sympatric with these spp. in SE. France), but in such localities usually having long wings (when folded have apices level with or surpassing knees of posterior femora), and subequal, separate, inner femoral spots which fade ventrally (in *C. barbarus* median of 3 spots usually largest, i.e. Text-fig. 2 : B–D, F–H. p. 293).

MEASUREMENTS	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width	213	3·4–4·6	3·83	368	4·4–6·2	5·13
Femur length	213	9·7–14·7	11·50	370	13·8–24·6	17·65
Tegminal length	214	10·4–22·2	15·37	364	14·2–31·3	23·44
Total length	217	16·1–28·7	21·09	371	21·9–41·6	32·10

DISTRIBUTION. Not found in North Africa or Spain south of the Pyrenees, it extends across southern and south-eastern Europe (see Text-figure 6, p. 301), western and southern Turkey, and follows a belt of cooler conditions into central Asia (Text-figure 7, p. 302). Its populations overlap in the east with those of *C. abbreviatus*. The species has the most northerly distribution of any species in Europe, extending down the Rhine following drier " Mediterranean " conditions.

MATERIAL EXAMINED. FRANCE : Pyrénées-Orientales, 8 ♂, 12 ♀, viii–xi ; Hérault, 5 ♂, 3 ♀, viii ; Paris, 2 ♂, — ; Seine-et-Marne, 1 ♂, vii ; Haute Loire, 4 ♂, 3 ♀, vii ; Puy-de-Dôme, 1 ♂, 3 ♀, vii ; Bouches-du-Rhône, 1 ♂, vii ; Lozère, 1 ♂, vii ; Alpes Maritimes, up to 660 m., 29 ♂, 41 ♀, viii-x ; Var, up to 350 m., 8 ♂, 14 ♀, viii–x ; Corsica, 2 ♂, 4 ♀, vii–ix. SWITZERLAND : Valais, up to 2,000 m., 2 ♀, viii. AUSTRIA : Burgenland, nr. Illmitz, 1 ♀, viii ; Salzburg, 5 ♂, viii ; L. Austria, 1 ♀, viii. GERMANY : Hessen länder, 1 ♂, 1 ♀, viii ; Bayern länder, 1 ♂, viii. ITALY : Spezia, 1 ♂, 1 ♀, vii ; Ravenna, 2 ♀, vii ; Basilicata, 420 m., 2 ♂, ix ; Grosseto, 60 m., 1 ♂ ; Puglia, 20 m., 2 ♀, ix ; Sardinia, 1 ♂, 3 ♀, vii. JUGOSLAVIA : Hrvatska, 10 ♂, 9 ♀, vi–ix ; Srbija, 680–1400 m., 9 ♂, 12 ♀, viii–x ; Črna Gora, 14 ♂, 17 ♀, viii–ix ;

FIG. 17. A.–D. Fastigium verticis of 3 males (A–C) and a female (D) of *C. coelesyriensis coelesyriensis* (Giglio–Tos) from a single Turkish population, to show range of variation. E–K. Male cerci : E and F. Lateral and dorsal aspects in *C. balucha balucha* Uv. G. and K. Lateral and dorsal aspects in *C. balucha brachypterus* (Dirsh). H and J. Lateral and dorsal aspects of cerci in *C. tenuicercis* Tarbinsky populations from nr. Amman, Jordan. L–O. Outer surface of apex of right male cercus in *C. coelesyriensis* (Giglio–Tos): L. Nominate subspecies, Turkey, İsparta prov., Sütçüler. M. Subspecies *hissaricus* (Mishch.), Iran, Shahrud. N. Nominate subspecies, Turkey, Muğla prov., Sandras Daği, 1,500 m., (intermediates between two subspecies). O. Nominate subspecies, Iran; Haftom prov. Lar (typical of larger specimens from semi-desert areas). P–U. Inner aspect of left posterior femur in *C. coelesyriensis* (Giglio–Tos) showing extent of black markings and intensity of pink pigmentation : P–R and U. Males ; S and T. Females. All nominate subspecies unless otherwise stated. P and Q. Turkey, Muğla prov., Sandras Daği, 1,800 m. R. Turkey, Urfa prov., Urfa (semi-desert non-melanic form). S. Turkey, Antalya prov., Gebiz (dark plateau form). T. Iran, Dovvom prov., Shahrud (subspecies *hissaricus* (Mishch.)), pink area being suffused with black pigment giving a dull mauve effect. U. Iran, Dovvom prov., Shahrud (light semi-desert form). In all femoral diagrams, background colour pale buff or straw colour (same as abdomen).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black pigment
pink pigment
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Vojvodina, 10 ♂, 21 ♀, vi–viii ; Hercegovina, 1 ♂, 1 ♀, ix. ALBANIA : Gjinokastër, 1 ♂, 3 ♀, viii–ix. GREECE : Makedhonia, 17 ♂, 12 ♀, vi–viii ; Kefallinía I., 7 ♂, 4 ♀, vii ; Évvoia I., 2,100–2,600 m., 14 ♂, 12 ♀, Stereá Ellás, up to 1600 m., 1 ♂, 3 ♀, vii ; Kérkira I., 4 ♂, 5 ♀, vii ; Trikkala, 2,000–2,300 m., 1 ♂, vii ; Samothráki I., 1 ♂, 1 ♀, vi ; Kriti I., up to 1100 m., 1 ♂, 6 ♀, vii–viii. CYPRUS : Limassol, 2 ♂, 2 ♀, v. TURKEY : Antalya, up to 1700 m., 1 ♂, 15 ♀, vii ; Istanbul, 9 ♂, 11 ♀, vii ; Kocaeli, 2 ♂, 2♀, viii; Izmir, 1 ♂, 2 ♀, vii ; Muğla, 2 ♂, 4 ♀, vii ; Konya, 2 ♀,— ; Sinop, 1 ♀, ix ; Urfa, 2 ♂, 1 ♀, vii ; Isparta, 1,600–1,700 m., 2 ♀, vii. IRAN : Dovvom, 4 ♂, 14 ♀, vi–x ; Hashtom, 1 ♂, v ; Dahom, 2 ♂, 3 ♀, vii–ix ; Markazī, 1 ♂, 2 ♀, vii–viii ; Nohom, 7 ♂, 2 ♀, vi. AFGHANISTAN : Mazar-i-Sharif, 5 ♂, 4 ♀, vi ; Badakhshan, 1,800–2,300 m., 5 ♂, 17 ♀, vii–viii ; Kataghan, 625–1,240 m., 1 ♂, 2 ♀, ix ; Kabul, 1,600–1,740 m., 7 ♀, ix–x ; Eastern Nuristan, 2,700 m., 1 ♀, vii. U.S.S.R. : Kazakhstan S.S.R., 12 ♂, 101 ♀, vi–ix ; Armeniya S.S.R., 3 ♂, 13 ♀, vi–viii ; Daghestan A.S.S.R., 8 ♂, 4 ♀, viii–ix ; Tadzhikistan S.S.R., 1 ♂, vii.

DISCUSSION. Although capable of living in relatively cold, moist environments, this species cannot tolerate wet alpine conditions. It does, however, penetrate into dry alpine conditions up the Rhône valley to Lake Geneva. It is the dominant species of the cold steppes of southern U.S.S.R. in the regions of the Black Sea, Caspian Sea, and Aral Sea, but in Southern Europe takes second place to *C. barbarus*. Amongst hundreds of *Calliptamus* specimens from Cyprus, only 5 were *C. italicus*. Unlike *C. barbarus* it does not thrive in extreme dune conditions, e.g. Rhône delta, and never reaches habitat altitudes like those of *C. subalpinus* (p. 338). La Greca (1958) states that in Italy the species occurs from sea level up to 1,000 m. It cannot tolerate the extreme aridity enjoyed by *C. barbarus* and therefore does not extend so far south as this species. None of the subspecies claimed for this insect seem to be valid. The male phallic complex shows complete uniformity throughout the range of the species, and other variations can be attributed to environmental effects (Discussion, pp. 301–306). The species shows little colour polymorphism except on the extreme southern edge of its distribution, *C. barbarus* displaying marked colour polymorphism even when sympatric with uniform *C. italicus* populations.

The only specimen of *Calliptamus* in the Linnaean collection is unlabelled, and is a female of *C. wattenwylianus*. Dr. Akå Holm informs me that there are no specimens of *C. italicus* labelled by Linnaeus in the Uppsala collections. I am applying, therefore, to the International Commission on Zoological Nomenclature for formal authority to reject the Linnaean specimen as type of *Gryllus* (*Locusta*) *italicus* and to designate a neotype. An application has been sent to the Secretary.

Calliptamus wattenwylianus (Pantel, 1896)

Caloptenus italicus var. *wattenwylianus* Pantel, 1896, *An. Soc. esp. Hist. nat.*, **25** : 70, 1 pl. [Holotype ♂, Spain, Malaga prov., Sitio. Paris Museum.]

Caloptenus okbaensis Kheil, 1915, *Int. ent. Z.*, **9** : 89, 101, Text-fig. 3. [Holotype ♂, Algeria, Constantine dep., Sidi Okba, 4.vii.1917, (*Kheil*). National Museum, Prague.] **Syn. n.**

DIAGNOSIS ♂. 1. Aedeagal valves slender, upturned, not decurved posteriorly (Text-fig. 13 : B. p. 311). Profile when covered by ectophallic pocket as in Text-fig. 3 : S. p. 296. Cingular

valve (Text-fig. 13 : C, a. p. 311) and lateral accessory processes of penis valves (Text-fig. 13 : C, l, and B, l. p. 311) pointed and membranous, latter curling dorsally to form a tube involving cingular and penis valves (Text-fig. 10 : E, l and m). Postero-dorsal part of cingulum and rami of cingulum (Text-fig. 13 : B, g. p. 311) rugose and swollen, though not overhanging tip of penis (as in *C. coelesyriensis*, p. 343). Dorsal ectophallic membrane plate with simple laminar posterior median edge (Text-fig. 13 ; E. p. 311), being only slightly thickened and rugosely sculptured in this region ; plate almost as wide as long (cf. Text-fig. 13 : F. p. 311). Rami of cingulum, viewed from a posterior aspect, converging upwards (Text-fig. 13 : B. p. 311).

2. Cercus variable apically (as in Text-fig. 25 : A–S). Always three apical lobes, though median lobe in some North African material may be very weak.

3. Tegmina often reduced in size ; Rs reduced to two branches in European forms, usually three branched in North African series.

4. Melanic forms (North African), or near melanic forms (E. Pyrenees) occur. Otherwise brownish grey with darker mottled spotting.

5. Inner side of posterior femora typically with inner median area pink, this colour extending on to lower inner carina (in *C. turanicus* never doing so). Three inner femoral spots (usually separate), median one largest, all extending to some degree below inner dorsal carina (Text-fig. 20 : H and K. p. 324) (in *C. turanicus* never doing so, Text-fig. 20 : J). In darkly pigmented material from N. Africa (Atlas), anterior and median spots may fuse, median spot in N. African material being larger in proportion than in European material even if unfused.

6. Posterior tibiae variable in colour, from pale flesh pink to crimson. Often paler externally than dorsally or internally, but can be uniformly pigmented. May be suffused with black giving dark mauve appearance (e.g. in Pyrenees and N. Africa).

7. Hind wings pale pink to deep crimson, pigmentation covering basal half to three-quarters of wing or more. Anal fan always more deeply pigmented than rest of wing. Folded wings usually not surpassing apices of folded posterior femora.

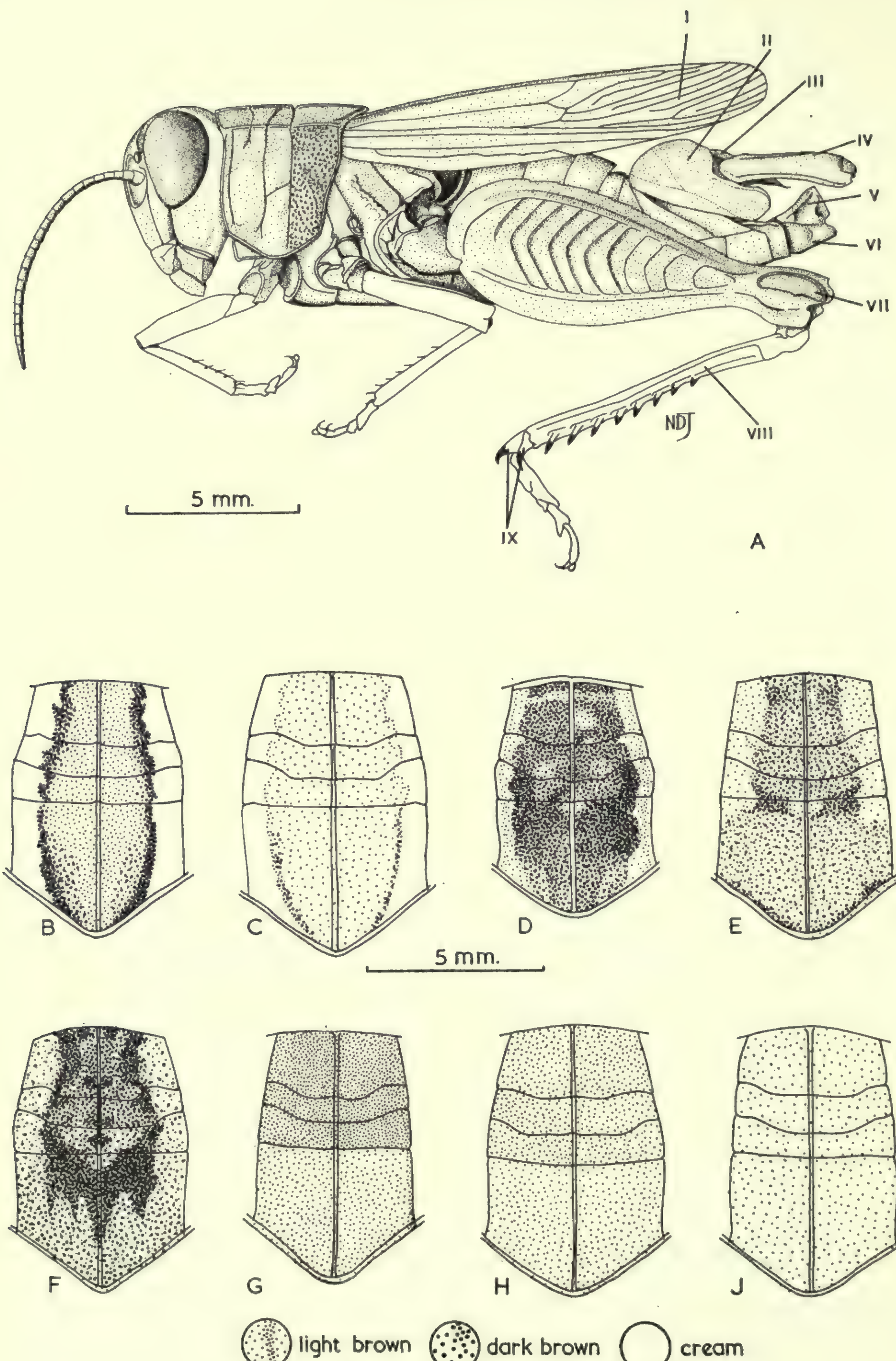
8. Tegmina coarsely spotted, though contrast not always marked, spots being merged into a rather uniform brown except at apex. In dark specimens with contrasting colouring, spots may become serially spaced blotches running diagonally across tegmen.

♀. Diagnosis as for male. Bulky insects with tegmina which taper conspicuously in their apical 2/3, and whose apices just surpass or just fall short of knees of folded posterior femora (see key to ♀♀, p. 310).

TABLE 1.

Tegminal apices surpassing (L), level with (=), or not reaching (S), tips of folded postr. femora	♂♂			♀♀		
	L	=	S	L	=	S
Morocco, Mouldirt	O	O			O	
Morocco, Muar nr. Tangier				O		
Morocco, Ijoukak					O	
Morocco, Volgrove		O				
Algeria, Mascara	O	O	O	O		
Algeria, Hauts Plateaux		O				O
Algeria, Djelfa	O	O	O	O	O	O
Algeria, Boghari	O	O	O	O		O
Algeria, Djuradjura Mts.		O	O		O	O
Libya, El Marj		O	O			O
Libya, Slonta		O	O		O	O
Libya, Shahhat	O		O		O	O

FIG. 18. Tegminal-femoral relationships for North African material of *C. wattenwylianus* (Pantel).


I
II
III
IV
V
VI
VII
VIII
IX
NDJ
5 mm.
A
B
C
D
E
5 mm.
F
G
H
J
light brown
dark brown
cream

MEASUREMENTS		Males				Females	
	No.	Range	Mean		No.	Range	Mean
Head width	78	3·8–4·7	4·17		118	5·0–7·1	5·78
Femur length	77	10·8–15·8	12·80		116	14·5–25·0	29·03
Tegminal length	77	10·2–18·7	14·80		117	12·8–31·5	21·56
Total length	77	17·3–28·1	21·43		117	21·6–41·9	31·51

DISTRIBUTION. Lying in two series of populations, separated by the Straits of Gibraltar (see Text-fig. 6, p. 301), this species penetrates the High and Middle Atlas mountains of Morocco, the uplands of Algeria, Tunisia, and eastwards to northern Libya, while in Europe it occupies southern and Eastern Spain, southern Mediterranean France, and lower valleys of the Maritime Alps.

MATERIAL EXAMINED. FRANCE : Pyrénées-Orientales, 3 ♂, 4 ♀, viii–xi ; Hérault, 1 ♂, vii : Var, 11 ♂, 26 ♀, viii–ix. SPAIN : Cadiz, 2 ♀, vi ; Gerona, 1 ♀,—. MOROCCO : Volubilis, 1 ♀, vii ; Moyen Atlas, up to 1,700 m., 3 ♂, 5 ♀, vi–ix ; Hauts. Atlas, 1,300–1,900 m., 21 ♂, 26 ♀, vii–viii ; nr. Tangier, 2 ♂, 5 ♀, viii ; nr. Fès, 1 ♀, viii. ALGERIA : Oran, 9 ♂, 6 ♀, vi ; Hauts Plateaux, 1,100 m. 1 ♂, 5 ♀, vi–ix ; Chardïa, 2 ♂, 8 ♀, x ; Alger, 7 ♂, 9 ♀, vii–ix ; Constantine, 1 ♂, 2 ♀, vii. TUNISIA : Gafsa, 1 ♂, iii. LIBYA : Cyrenaica, 4 ♂, 11 ♀, vii–ix.

DISCUSSION. This species shuns either high altitude and cold humid conditions, or extreme dryness. Consequently although often sympatric with *C. barbarus*, *C. italicus*, and *C. subalpinus*, it has a more restricted distribution than the first two, and does not enter montane habitats with the last. Usually in a minority, it has been found in swarm proportions, forming up to 90% of the *Calliptamus* populations present. Typical localities are found on old stabilized dunes, or among untended vineyards.

C. okbaensis is synonymized in this paper with *C. wattenwylianus* since in the morphology of the male genitalia both are identical. Both species show :

(i) tendency to formation of melanic forms,
(ii) shortening of tegmina with altitude,
(iii) same variations of epiphallus, femoral markings, and tegminal venation,
(iv) same range of size as measured by total length and head width.

FIG. 19. A. Lateral aspect of entire male of *C. cyrenaicus* sp. n. to show external taxonomic characters used in this genus. I. Tegmen or forewing ; II. Swollen 9th and 10th abdominal tergites ; III. Supra-anal plate ; IV. Cercus—used as a clasping organ during copulation ; V. Ectophallic pocket covering penis valves (cf. Fig. 2 : A) ; VI. Subgenital plate ; VII. " Knee " of posterior femur ; VIII. Posterior tibia and spines ; IX. Posterior tibial spurs (outer pair). B–J. Dorsal aspect of pronotum in a series of specimens of *C. cyrenaicus* sp. n. (from Libya, Cyrenaica prov., Shahhat), to show range of colour polymorphism. B. var. *marginellus* in its most striking form. C. paler form of B., with central area ginger brown. D–F. commonest forms in any population. These predominate almost completely in boreal populations of *C. italicus* (L.) and *C. barbarus* (Costa). G–J. uniformly pigmented forms, G. having a disc to posterior transverse sulcus slightly darker in colour. G. dark and light red-brown, J. pale buff, H. intermediate between these two extremes.

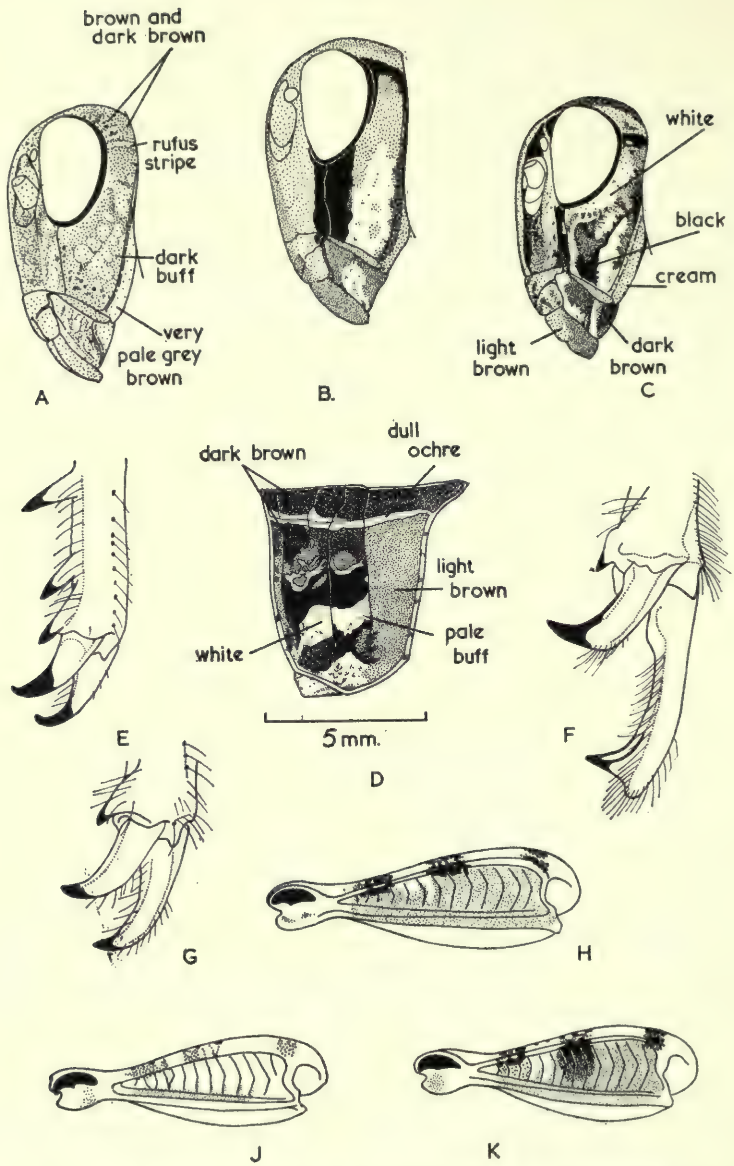


FIG. 20. A–C. Lateral aspect of head in 3 individuals of *C. cyrenaicus* sp. n. to show colour polymorphism. (N.B. 5 mm. scale refers to diagrams A–D). D. Lateral aspect of pronotum in some species, to show general pattern typical of genus as a whole. E–G. Posterior tibial spurs in the genera *Calliptamus* Serville (E), *Caloptenopsis* I. Bolivar (F) (cf. Fig. 3 : U), and *Acorypha* Krauss (G). H–K. Inner surface of left posterior femur. J. pale male form in *C. turanicus* Tarbinsky. K. dark female form in *C. wattenwylianus* (Pantel) from south-eastern France. H. intermediate form with medium development of melanic areas in female of *C. wattenwylianus* (Pantel) from eastern French Pyrenees. (colour represented as in Fig. 9 : P–U).

" *Okbaensis* " was created to differentiate long-winged forms of the species. An examination of Text-figure 18, p. 321, which shows tegminal/femoral relationships in North African material, indicates that the species tends to produce shorter winged forms in Cyrenaica and Libya. It is interesting to note that the epiphalli of series from the Alpes Maritimes and Libya resemble each other quite closely, intermediate forms in the Eastern Pyrenees having smaller lateral fenestrae and a larger median fenestra, the lower median fenestra often being occluded (cf. Text-figs. 14 : H and E. p. 313). In epiphallic characters therefore, material from Libya and south-eastern France, forms two groups of populations relatively isolated from their neighbours to the west, but apparently similar to each other. The ratio of male femur length to head width shows a rise eastwards in N. Africa from Morocco to Libya, i.e. Ait Bou Guemmez 2·97, Mascara 3·08, Boghari 3·23, Slonta 3·23. The Atlas mountain ratio is similar to that for populations in the Alpes Maritimes foothills, i.e. Méounes 2·97, St. Maximin 2·91. Females show similar trends, populations in the Atlas mountains showing a ratio value of 3·18–3·39, montane forms of *C. turanicus*, e.g. from Afghanistan, Senna (1800 m.) having similar ratios, i.e. 3·29.

Calliptamus turanicus Tarbinsky, 1930

Calliptamus italicus var. *wattenwylianus* Jacobsen & Bianchi, 1902, *Orthoptera and Odonata of the Russian Empire* : 317.

Calliptamus turanicus Tarbinsky, 1930, *Bull. Acad. Sci. U.R.S.S.*: 184. [Holotype ♂, Tadzhikstan S.S.R., Golodnaya Step'. Leningrad Museum.]

DIAGNOSIS ♂. 1. Penis valves, cingular valve, and lateral accessory processes of penis valves like those of *C. wattenwylianus* (see diagnosis of that species, p. 311 and Text-fig. 13 : A. p. 320). Cingular rami diverge dorsally. Ectophallic membrane plate (Text-fig. 13 : A, c, and F. p. 311) with laminar median posterior tip, only slightly thickened and rugosely sculptured. Ectophallic plate much longer than wide.

2. Cercus with upper and lower apical lobes almost equal in size and length (like Text-fig. 24 : J. p. 336), median apical lobe being more or less obliterated (especially in montane forms).

3. Tegmina moderately to well developed, Rs possessing 3 or 4 branches (3 branches in montane forms from south of species range).

4. General colouring pale brown with darker brown markings. No evidence of extreme " *marginellus* " variety, pronotum usually a pale form of type D (Text-fig. 19. p. 322) with more uniform colouring, or as type H. Tegmina with discrete brown spots, never reduced to mere peppering as in *C. coelesyriensis* nor developed into bold transverse bands.

5. Dorsal spots of posterior femora never extend across upper inner carina on to inner face of femur (Text-fig. 20 : J. p. 324). Inner area pale buff except in montane forms where it may be almost completely filled with a suffuse brown pigment. Lower inner carina often pigmented with pale orange pigment, though often this is absent.

6. Posterior tibiae deeply to lightly pigmented with orange-red on their inner and ventral surfaces, often with a pale zone about 5 mm. from their proximal end.

7. Hind wings boldly suffused with pink, this colour fading apically. Folded wings with apices surpassing knees of folded posterior femora. Wings shorter in montane forms, so that wing apices level with, or just short of, knees of folded femora, e.g. in NE. Afghanistan.

♀. Bigger than females of *C. italicus* from the same area. Otherwise all other characters identical.

MEASUREMENTS	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width	8	4·2–5·0	4·58	15	6·3–7·1	6·56
Femur length	8	12·4–15·8	14·68	15	20·7–25·7	23·36
Wing length	8	14·2–24·4	20·66	15	24·3–37·2	32.73
Total length	8	21·0–32·3	27·89	15	39·1–50·1	44·19

DISTRIBUTION. In U.S.S.R. (Turkmenskaya, Uzbekskaya, Tadzhikskaya, Kirghizkaya, Kazakhskaya) up to eastern end of northern slopes of Tien Shan ranges, and into the north facing valleys of Afghanistan up to about 2,000 metres above sea level (see Text-fig. 7, p. 302).

MATERIAL EXAMINED. AFGHANISTAN : Badakhshan, Senna, 1800 m., 2 ♂, 1 ♀, vii. U.S.S.R. : Kazakhstan S.S.R., 1 ♂, 8 ♀, ix ; Tadzhikistan S.S.R., 3 ♂, 4 ♀, vii ; Uzbekistan S.S.R., 1 ♂, 1 ♀, viii.

DISCUSSION. Probably this species has evolved quite recently, after geographical separation from *C. wattenwylianus*, from which it is derived. Its southernmost populations resemble *C. wattenwylianus* very closely in all but the phallic characters. The high passes, dividing the Amu Darya river systems from the Kabul River system to the south, offer a barrier to its expansion into southern Afghanistan.

Calliptamus abbreviatus Ikonnikov, 1913

Calliptamus abbreviatus Ikonnikov, 1913, Kuznetsk : 21. [Holotype ♂, U.S.S.R., Primorskiy Kray terr., Ozero Khanka, Kamen' Rybolov, Sikhote Alin. Leningrad Museum.]
Calliptamus sibiricus Vnukovsky, 1926, *Mitt. münch. ent. Ges.*, **16** : 91. [Unknown number ♂ syntypes, U.S.S.R., SW. Siberia, Bezirk Kamenj. Tomsk State University.]

DIAGNOSIS ♂. 1. Phallic complex like smaller version of *C. italicus* (Text-fig. 10 : A, B. p. 307), with penis valves relatively shorter. Penis valves project beyond tips of lateral penis valve appendices a distance equal to, or less than, length of lateral penis appendices themselves (Text-fig. 10 : B, m and l).

2. Cercus apex variable. Usually like Text-fig. 17 : H. p. 319. Lower pair of lobes may fuse (but are always shorter than upper lobe, cf. *subalpinus*, p. 338), or lower lobe may be very weakly developed forming a blunt obliquely rounded area below median lobe (as in some *Stobbea* spp.).

3. Tegmina tapered in apical 2/3, when folded their apices falling short of knees of folded posterior femora.

4. Pronotal and body colour usually dark brown, speckled with blackish brown. Pronotum typically type E (Text-fig. 19, p. 322) ; little colour polymorphism. Tendency to form "*marginellus*" variety slight.

5. Posterior femora pale body colour on inner surface, with three separate dark brown spots. Lower inner carina and inter-carinal area suffused with dull ruby-red. Femoral spots variable in development, middle spot sometimes produced slightly below upper inner carina, while posterior spot remains large enough to reach lower inner carina. Middle and posterior spots sub-equal in size.

6. Posterior tibiae dull deep ruby-red.

7. Hind wings colourless. Never so reduced as to be non-functional for flight.

♀. Very difficult to differentiate from *C. subalpinus* except on distribution (see Text-fig. 6, p. 301). Unlike short-winged *C. italicus* in Afghanistan, never has pink hind wings. Other characters as males.

Measurements	Males				Females		
	No.	Range	Mean		No.	Range	Mean
Head width . .	19	3·0–4·1	3·58	.	16	3·3–6·0	4·85
Femur length . .	19	8·7–11·3	9·91	.	16	13·2–17·2	15·54
Tegminal length .	19	7·7–11·7	9·57	.	16	13·8–18·4	16·25
Total length . .	19	12·3–17·6	14·85	.	16	19·6–30·4	24·23

Distribution. Present in northern China (Text-fig. 7, p. 302), it extends into Manchuria, northern Mongolia, north-western Kazakhstan, and into the south-eastern edge of the Siberian plateau.

Material examined. U.S.S.R.: Kazakhstan S.S.R., 6 ♂, 2 ♀, vii–viii; Karel' Skaya A.S.S.R., 2 ♀, x; Altayskiy Kray, 1 ♂, 1 ♀, viii; Siberia, 3 ♂, 2 ♀, viii; Primorskiy Kray, 1 ♂, 1 ♀, ix. China: Shantung, 1 ♂, 1 ♀, ix; Heilungkiang, 1 ♂ 1 ♀, —; Hopeh, 1 ♂, 1 ♀, viii; Gungulin, 1 ♂, 1 ♀, viii; Kiangsu, 2 ♂, 2 ♀, vii–xi; Inner Mongolia, 2 ♀, —.

Discussion. Closely related to *C. italicus* (see p. 292 on probable origins), it is adapted to the wide range of climatic conditions offered by the contrast between northern China and southern Siberia. Its reported distribution in the Mediterranean region was based on confusion with *C. subalpinus*. *C. abbreviatus siciliae* has now been raised to species status, while it is clear that synonymy of *C. ictericus* with *C. abbreviatus* by Tarbinsky (1930) was based on misleading evidence.

Calliptamus barbarus (Costa, 1836)

Synonymy under subspecies.

Diagnosis ♂. 1. Penis valves strongly sclerotized (Text-fig. 25: A, D and F. p. 339), thickened and rugose or rather smoother and elongate, wider dorsally (shown in T.S., Text-fig. 10: E, m. p. 307), and often splayed out to give a spatulate outer margin to each (Text-fig. 25: J. p. 339). Lateral appendices of penis valves (Text-fig. 25: D, 1) blunt, sclerotized, but never expanded in such a way as to hide penis valves when viewed from a lateral aspect (Text-fig. 13: D, f). Cingular valve not usually heavily sclerotized, never overlapping penis valves so as to hide them from above (Text-fig. 25: D, m). Dorsal ectophallic plate with simple laminar, upcurved, slightly thickened, posterior median lobe. Epiphallus very variable.

2. Cercus very variable (Text-fig. 24: III–V and VII–XVI. p. 336). Lobes distinct, except in montane or boreal forms, where median and lower lobes merge (Text-fig. 24: VIII, XI, XIV). Median lobe equal to, shorter than, or longer than lower apical lobe (if shorter then like *C. subalpinus*, Text-fig. 24: XVIII).

3. Folded tegmina with apices surpassing (4 branches of Rs), level with, or not reaching knees of folded posterior femora. May be short and functionless for flight.

4. Colour polymorphism (see pp. 301–306) very marked, especially in south and south-east of geographical distribution. "*Marginellus*" form produced frequently. No melanic forms.

5. Posterior femora very variable, inner side varying from pale dull yellow to orange or bright crimson, with all possible intermediate shades. Inner femoral spots showing all degrees between complete separation to complete fusion (Text-fig. 2: B–D and F–H). Boreal forms often retain only median spots (formed by reduction of solid ovoid inner femoral spot found in southern populations). Fusion of spots initially between anterior pair of spots. Excessive deposition of melanins leads to extension of inner femoral spot across lower inner carina, where mixed with red pigment a violet effect is produced (really a dark ruby-red containing no blue element).

Median inner femoral spot usually larger than other two, though in southern France often paralleling *C. italicus* very closely (Text-fig. 2 : E and H. p. 293).

6. Posterior tibiae pale dull yellow, to orange, to ruby-red. Black pigment produces dark ruby colour, or dull pink, depending on intensity of red component.

7. Hind wings usually strongly flushed with pink in at least basal half. Extreme montane forms often have colourless wings.

8. Tegmina usually coarsely spotted, but spot pattern very variable. In "*marginellus*" variety wing may be uniform brown ; with pronotum type H (Text-fig. 19, p. 322) tegminal blotches almost disappear. Blotches may vary in intensity, being sharply defined in semi-desert and yellow-legged forms (e.g. old f. *pallidipes*). Usually parallels *C. italicus* very closely where their ranges cross. Spot positions not fixed in relation to wing veins ; may be orientated at random or in roughly parallel bands across tegmen.

♀. Very often difficult to separate from sympatric *C. italicus*, *C. subalpinus*, and *C. wattenwylianus* (see p. 318, ♀ diagnosis for *italicus*). Tegmina are not as abruptly tapered in their apical 2/3 as those of *subalpinus* and *wattenwylianus* in such localities. Yellow or orange-legged females possessing a single large inner femoral spot filling inner inter-carinal area can only belong to *C. barbarus* or *C. tenuicercis*. If orange-legged, then presence of orange colouring just posterior to black inter-carinal spot is diagnostic of *C. barbarus*. Female characters other than colour very uniform throughout genus. Male material necessary for accurate determination.

MEASUREMENTS. See under subspecies.

DISTRIBUTION. Wide geographical range (Text-fig. 23, p. 333) ; occupying more southerly areas than *C. italicus* (see Text-fig. 6, p. 301). Does not extend as far north as that species, e.g. in Massif Central of France it only survives in sheltered hollows and valleys, and does not reach northern edge of the massif. In North Africa altitudes of 2,000 metres are attained, in Afghanistan material being collected from 2,300 metres. In southern Europe specimens seldom found above 500 metres (probably too wet). Occupies almost every dry Mediterranean or semi-desert region and steppe of the Palaearctic, including the islands of the Mediterranean.

MATERIAL EXAMINED. See under subspecies.

DISCUSSION. Now included in *C. barbarus barbarus* are subspecies and species defined principally on colour characters, e.g. yellow or orange-legged forms include *Caloptenus discoidalis*, *C. barbarus* var. *pallidipes*, *C. barbarus monspelliensis*, *C. barbarus pallidipes f. salina*, *C. cephalotes*, *Caloptenus italicus* var. *deserticola* (last two identical) ; ruby-legged forms *C. barbarus minimus*, *C. barbarus parvus* (both small boreal forms). Throughout the entire range of distribution the male genitalia offer uniform facies, except in Israel (see subsp. *palaestinensis*, Text-fig. 25 : J. p. 339). Elsewhere penis valve variation as a whole does not exceed that for any one locality. The following is a brief résumé of colour variation of this species throughout its range :

(i) Spain and Portugal. Ruby-legged in C. and N. Spain, and Portugal (pale pink) ; femoral spots bold and separate ; tegminal apices level with or surpassing knees of posterior femora. Pale orange-legged in S. and E. Spain ; single black inner femoral spot. Wing length as in first form. Probably narrow zone of intermediates.

(ii) France. Massif Central and Ile d'Oleron series, small sized ; ruby-legged with separate inner femoral spots. Provence series similar ; "*marginellus*" form commoner near coast ; tegmina fall short of knees of posterior femora in series above 400 metres. Coastal forms have median femoral spot enlarged ; upland or

boreal forms spots subequal. Delta and dune populations with fused femoral spots (former subsp. *monspelliensis*).

(iii) Italy. North-south cline. In north like France. Coastal forms tend to have tegmina surpassing knees of folded posterior femora, but in C. Italy may vary in one locality from falling short to surpassing knees of posterior femora. In S. Italy long-winged form predominates, except at higher altitudes, e.g. 200–500 m. near Cosenza, where all have tegminal apices falling short of knees of posterior femora. S. Italy all forms orange-legged (gradual cline from N. Italy) ; middle inner femoral spot enlarges (however reversed at high altitudes, e.g. Potenza 850 m., where red-legged with sub-equal spots).

(iv) Sardinia, Mallorca, Lipari Is. Orange-legged. Tegminal apices tend to surpass knees of posterior femora (except in Sardinia).

(v) Greece. North-south cline from red to orange to yellow-legged forms (i.e. further east and drier). NE. Greece series orange-legged ; spots fused or separate ; like W. Turkey. From about Trikkala southwards, wings longer and legs paler orange (see sexual polymorphism, p. 303). Middle spot enlarges. Pelóponnisos series all yellow-legged, folded tegminal apices surpassing knees of posterior femora (reversal of trends on Mt. Kelmos, grey-ruby legged at 900–1,000 m.). Nauplion series show males ranging from orange-legged to yellow-legged. In S. Greece forms with single fused femoral spot predominate.

(vi) Crete, Sporádhes, Cyprus. In Cyprus yellow-legged (except Mt. Troodos, see p. 303) ; single fused inner femoral spot. In both other islands bright orange-legged series ; dark brown "*marginellus*" forms ; in Crete many specimens show separate inner femoral spots.

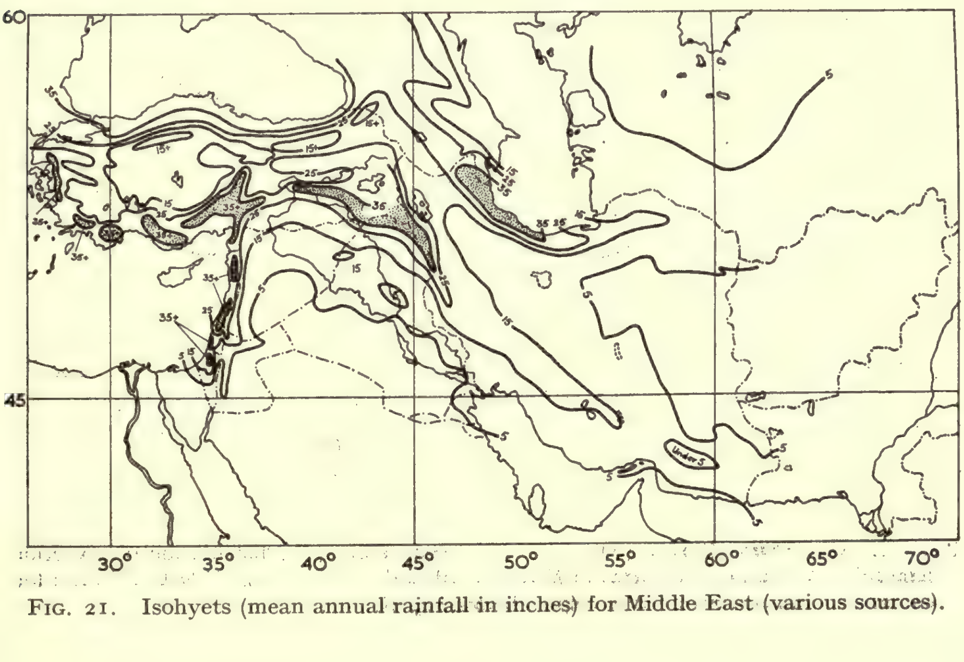


FIG. 21. Isohyets (mean annual rainfall in inches) for Middle East (various sources).

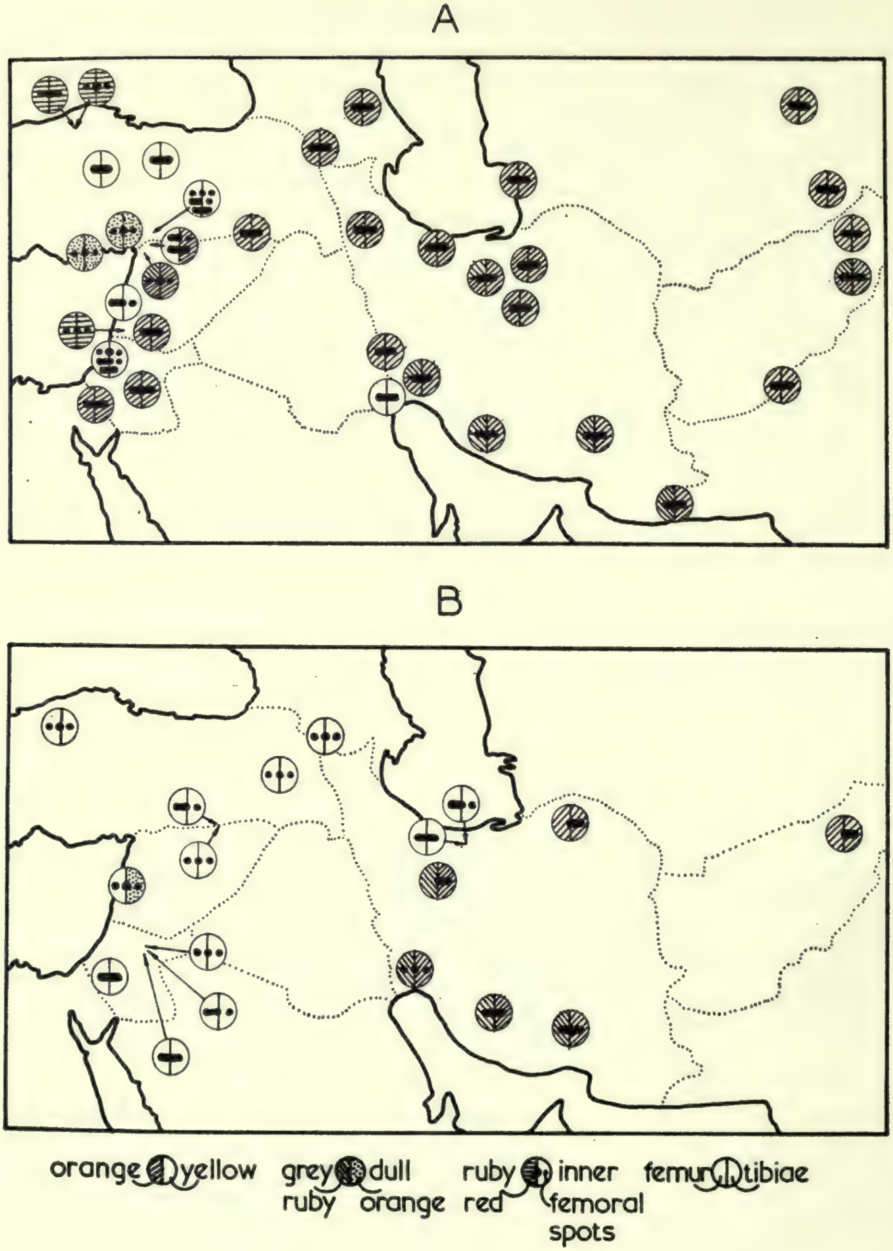


FIG. 22. *C. barbarus* (Costa) (A) and *C. tenuicercis* Tarb. (B); distribution of posterior femoral and tibial colour forms in Middle East and central Asia. Key to symbols for colour and melanic inner femoral spots below Fig. B.

(vii) Turkey. Four main colour types which intergrade :

(*a*) Small ruby-legged form ; separate femoral spots, median largest ; range NW. Turkey and all N. Turkey (identical with C. France, Kashmir, and NE. Greece material).

(*b*) Small yellow-legged ; separate to completely fused femoral spots. C. Turkey (Ankara—Amasya plateau).

(*c*) Orange-red legged forms ; larger size than (*a*) or (*b*). Very polymorphic (like Crete and Sporádhes material). Above 3000 ft. inner femoral spots separate (like (*a*)). W. and SW. Turkey.

(*d*) Large orange-legged form ; yellow-legged forms present with all grades to orange form. Inner femoral spots always a fused block. Wing apices exceed knees of posterior femora. SE. Turkey into Syria.

The remaining populations of *C. barbarus* can be split into 4 clines :

(*a*) North Africa. Extreme north of Morocco has yellow-legged populations (inner femoral spots separate to single solid marking.) Transition over narrow zone to orange-legged form ; tegminal apices level with, or surpass, knees of folded femora. In eastern Algeria, Tunisia and Libya, single black inner femoral spot extends below lower inner carina, and darkens orange-red pigment below. In upland areas, e.g. Chrea, nr. Blida (13,00 m.), replaced by smaller red-legged form with separate inner femoral spots, this montane form reaching extreme of brachypterism in Atlas mountains.

(*b*) Bulgarian—Caspian cline. Gradual change eastwards from small red-legged, short-winged form, to a longer-winged, orange-legged form, whose inner femoral spots are completely fused. Transition complete in region of Caspian Sea. Populations in Kazakhstan and Tien Shan very uniform, inseparable from *C. b. deserticola*.

(*c*) Kazakhstan—West Pakistan. Almost completely uniform ; orange-legged with fused inner femoral spots. South of high passes of Hindu Kush, black area extends below lower inner carina (as in N. African material above), producing blackish ruby-red colour. Thus in contrast, material from Lake Balkash region has only orange on lower inner femoral area. Wing length decreases with altitude up Amu Darya river system, eventually tegminal apices in all specimens falling short of knees of folded femora. If in a lowland population, tegminal length varies so that in some, tegminal apices surpass knees of posterior femora, while in others they fall short of knees of posterior femora ; long winged type is always found among larger insects. East of Chitral, Kashmir populations are red-legged (cf. N. Turkey).

(*d*) Iranian—Jordan rift valley cline. Orange-legged, semi-desert form found throughout Iran (south of Elburz mountains), Iraq, and Syria. Black area developed maximally in S. Iraq and SW. Iran. In Jordan orange-legged form dominant on east side of Jordan valley westwards forming transition to yellow-legged members of nominate subspecies and finally yellow-legged subsp. *palaestinensis* (Text-fig. 9, p. 305). Orange-legged form in Negev desert, and at Iskerderim and Yerevan (Turkey) has transitional and yellow-legged forms sympatric with it.

Yellow-legged *C. tenuicercis* and *C. barbarus* are often difficult to separate (refer to Text-fig. 22 : A and B, p. 330). In Turkey both sexes of *C. tenuicercis* have separate inner femoral spots, while *C. barbarus* often shows fusion (best therefore separated

on male genitalia, see key, p. 306, and Text-figs. 15 and 25). In Syria yellow-legged *C. barbarus* has solid inner femoral spot and tegminal apices which exceed tips of folded posterior femora. Sympatric *C. tenuicercis* has separate to partly fused femoral spots, and tegminal apices which are level with knees of posterior femora. In Israel both species have yellow-legged forms with solid inner marking, but this form of *C. tenuicercis* only sympatric with orange-legged forms (for separation see p. 328, ♀ diagnosis).

The type of *C. montanus* has been found to have genitalia identical with *C. barbarus barbarus*, *C. ictericus* is synonymized with *C. barbarus*, as the description of the female type (type lost) which came from Cadiz, fits known orange and yellow legged *C. barbarus* material from S. Spain. Unfortunately the specimen was already badly broken when described, and probably faded, the description leading to the report of this species from North Africa and elsewhere. *C. wattenwylianus* has been the species most often given this name (e.g. Brunner, 1882; Finot, 1883). *C. subalpinus* was also formerly called "*ictericus*". Grassé & Hollande (1945) introduced *C. ictericus chopardi* to embrace pink-winged forms of *C. subalpinus*, unfortunately choosing a ruby-legged boreal form of *C. barbarus* as type. Synonymy of *C. ictericus* with *C. abbreviatus* (see discussion p. 327 under *C. abbreviatus*), led Grassé & Hollande to give *C. ictericus chopardi* a very wide range in southern Europe, the geographical range of *C. abbreviatus* being added as well. *C. barbarus minimus* and *C. barbarus parvus* are small boreal forms of the nominate subspecies, *C. barbarus nanus* being a montane form of *C. barbarus cephalotes* (for discussion of montane forms, see p. 302). *Caloptenopsis punctata* has genitalia identical with nominate subspecies; *Caloptenus discoidalis* is a female type (not male as stated in description) of *C. barbarus barbarus* (yellow-legged form, but outside geographical range of subsp. *palaestinensis*).

C. palaestinensis survives as a subspecies of *C. barbarus* with unique genitalia (Text-fig. 25: J. p. 339). *C. palaestinensis erythrocnemis* is a montane form of it which falls as a synonym.

Loss of the type of *C. barbarus* has required designation of a neotype; this has been chosen from material corresponding to the original description and from near the type locality in Italy.

Key to Subspecies ♂

1. Penis valves elongate, rather thinly sclerotized, with widely divergent dorso-laterally splayed flanges (Text-fig. 25: J, m. p. 339). Cercus in high montane forms with tendency to weak differentiation of median and lower lobes. Tips of folded tegmina may just surpass knees of folded posterior femora. Posterior tibial colour and inner femoral flush, pale yellow to bright red. Inner femoral spots fused or discrete
barbarus palaestinensis Ramme (p. 335)
(Lebanon Ranges: West of Dead Sea—Jordan Valley, generally in area with mean annual rainfall 28 in. (700 mm.) or more).

–. Penis valves blunt, rather strongly sclerotized, parallel; slightly splayed on dorso-lateral edges (Text-fig. 25: B. p. 339). Cercus usually with separate lower apical lobes (fused in montane forms). Tips of folded tegmina not reaching, to surpassing, knees of folded posterior femora. Posterior femora dull pale yellow, orange or red internally. Black pigment below lower inner carina may cause orange-red pigment to assume mauve appearance . . . . . **barbarus barbarus** (Costa) (p. 333)

Calliptamus barbarus barbarus (Costa)

Acridium barbarum Costa, 1836, *Fauna del Regno di Napoli. Ortotteri*: 13, pl. 1, A–D, Naples. [Type lost. Neotype ♂, Italy, Salentina pen., Lecce prov., S. Puglie reg., Maglie, 70 m., 29.ix.1937 (*F. E. Zeuner*). Brit. Mus. (Nat. Hist.)].

Caloptenus siculus Burmeister, 1838, *Handbuch der Entomologie*, **2**(2): 639; Ramme, 1951: *Mitt. zool. Mus. Berl.*, **27**: 311. [Type lost.]

Calliptamus ictericus Serville, 1838, *Histoire Naturelles des Insectes*. In Roret, *Collection des Suites à Buffon. Orthoptères*: 689, Paris. [Holotype ♀, Spain nr. Cadiz. Type lost.] **Syn. n.**

Calliptamus cephalotes Fischer de Waldheim, 1846. *Entomographie de la Russie*, **4**: 243, Moscow. [Types lost.]

Caloptenus discoidalis Walker, 1870, *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum*, **4**: 684, 686; Uvarov, 1922 *Trans. ent. Soc. Lond.*: 136. [Holotype ♀ (not ♂), Lower Egypt, Brit. Mus. (nat. Hist.)] **Syn. n.**

Calliptamus minimus Ivanov, 1888, *Arb. Ges. Natur. fr. Univ. Charkov*, **21**: 35. **Syn. n.**

Caloptenus italicus var. *deserticola* Vosseler, 1902, *Zool. Jb.* (*Syst.*), **16**: 395; Chopard, 1943: *Faune Emp. franç.*, **1**: 404. [Syntypes ♂♀, Tunisia, nr. Gabès, 1902 (*A. Weiss*).] **Syn. n.**

Caloptenopsis punctata Kirby, 1914, *The Fauna of British India including Ceylon and Burma*. Orthoptera (Acrididae): 260, London. [Syntypes ♂♀, W. Pakistan, Jammu and Kashmir state, Baltistan reg., Brit. Mus. (nat. Hist.).] **Syn. n.**

Calliptamus montanus Chopard, 1936, *Bull. Soc. Sci. nat. Maroc*, **16**: 177. [Holotype ♂. Morocco, Moyen Atlas, Afraou des Beni Abdallah, 2,550 m. Paris Mus.] **Syn. n.**

Calliptamus barbarus monspelliensis Grassé & Hollande, 1945, *Arch. Zool. exp. gén.*, **84**: 49–69. [Unknown number of syntypes, ♂♀. Paris Mus.] **Syn. n.**

Calliptamus ictericus chopardi Grassé & Hollande, 1945, *Arch. Zool. exp. gén.*, **84**: 49–69. [Holotype ♂, France, Fontainebleau. Paris Mus.] **Syn. n.**

Calliptamus barbarus pallidipes Ramme, 1951, *Mitt. zool. Mus. Berl.*, **27**: 311. [Morocco. Paris Mus.] **Syn. n.**

Calliptamus barbarus nanus Mishchenko, 1951, In G. G. Beĕ-Bienko & L. L. Mishchenko, *Opred. Faune U.S.S.R.*, **38**: 257, Text-figs. [Holotype ♂, Tadzhikistan S.S.R., Zeravshanskiy Khrebet mts., Pendzhikent, Dolina Aranpaia, 1,500–2,050 m., 21.vii.1942, (*M. Rubuov*). Leningrad Mus.] **Syn. n.**

Calliptamus barbarus pallidipes f. salina Maran, 1954, *Sbor. ent. Odd. nár. Mus. Praze*, **28** (406): 153. [Holotype ♂, Bulgaria, Sv. Vlas, 6.viii.1938, (*L. Hoberlandt*) Prague nat. Mus.]

DIAGNOSIS. See key p. 332, and diagnosis of species p. 327.

FIG. 23. *C. barbarus* (Costa); trans-Palaearctic distribution.

MEASUREMENTS	Males				Females		
	No.	Range	Mean		No.	Range	Mean
Head width . .	497	2·8–4·8	3·69	.	897	4·2–6·8	5·26
Femur length . .	492	7·8–17·4	10·85	.	875	12·0–22·7	14·45
Tegminal length .	495	9·3–23·6	14·46	.	896	10·3–34·8	23·24
Total length . .	494	10·5–30·5	20·10	.	855	18·2–46·5	31·66

DISTRIBUTION. As indicated for species, excluding area occupied by subsp. *palaestinensis* Rme. (see Text-fig. 9, p. 305). The range of the nominate subspecies into the Canary islands mentioned by Willemse (1936) was based on information supplied by Ramme, who said he had collected material from there. As far as is known *C. plebeius* is however the only species found on those islands.

MATERIAL EXAMINED. PORTUGAL: Alto Alentejo, 9 ♀, —; Trans-os-Montes e Alto Douro, 5 ♀, viii–xi. SPAIN: Segovia, 4 ♂, 6 ♀, viii; Murcia, 4 ♂, 3 ♀, ix; Granada, 1,800 m., 1 ♀, ix; Avila, 1 ♂, 4 ♀, v; Alicante, 2 ♂, 2 ♀, ix; Santander, 1 ♂, 2 ♀, ix; Gerona, 4 ♂, 2 ♀, ix; Barcelona, 1 ♂; 5 ♀, viii; Mallorca I., 1 ♂, 7 ♀, xi. FRANCE: Pyrénées–Orientales, 15 ♂, 15 ♀, viii–ix; Aude, 13 ♂, 4 ♀, viii; Puy-de-Dôme, 19 ♂, vii; Lozère, 1 ♂, vii; Hérault, 17 ♂, 10 ♀, vii–viii; Bouches du Rhône, 2 ♂, 1 ♀, viii; Var, 16 ♂; 17 ♀, viii–x; Alpes–Maritimes, 35 ♂, 52 ♀, vii–ix. ITALY: Lecce, 21 ♂, 12 ♀, ix–xi; Foggia, 2 ♂, 1 ♀, vii; Imperia, 1 ♂, 2 ♀, vii–x; Potenza, 2 ♂, 1 ♀, viii; Grosseto, 60 m., 1 ♂, 3 ♀, ix; Napoli, 7 ♂, 7 ♀, vii–ix; Basilicata, 420 m., 5 ♂, 6 ♀, ix; Sardinia I., 2 ♂, 2 ♀, vii; Lipari I., 3 ♂, 7 ♀, viii; I^e di Tremiti, S. Nicola, S. Domino, Pianoso, Capraia, 4 ♂, 4 ♀, vi–ix; Roma, 1 ♂, 1 ♀, —; Bari, 2 ♂, 2 ♀, ix; Sicily, 2 ♂, viii. JUGOSLAVIA: Srbija, 9 ♂, 21 ♀, viii–x; Vojvodina, 60 m., 2 ♀, viii; Makedonija, 100–200 m., 1 ♂, 2 ♀, viii. HUNGARY: btwn. Tiza and Dunar R., 5 ♂, 5 ♀, vii. GREECE: Makedhonia, 2 ♂, 10 ♀, vi–viii; Thessalia, 2,000–2,300 m., 2 ♂, vii; Stereá Ellás, 13 ♂, 23 ♀, vii–viii; Sporadhes I^e, 400 m., 10 ♀, vii; Rodhos I., 2 ♂, 2 ♀, viii; Pelopónnisos, 900–1,000 m., 24 ♂, 27 ♀, vii; Kriti I., up to 1,700 m., 12 ♂, 27 ♀, vii–viii. CYPRUS: Very long series from all parts. MALTA: 1 ♀, —. MOROCCO: Moyen Atlas, up to 2,550 m., 7 ♂, 27 ♀, vi–ix; Hauts Atlas, up to 1,700 m., 3 ♂, 4 ♀, vi–ix; Tangier, 1 ♀, viii; Rabat, 6 ♂, 4 ♀, vi; Port Lyautey, 2 ♂, 2 ♀, viii; Ceuta, 1 ♂, 2 ♀, —; Ifrane, 1 ♀, viii. ALGERIA: Alger, up to 1,300 m., 8 ♂, 25 ♀, vii–ix; Chardaïa, 46 ♂, 92 ♀, x; Oran, 2 ♀, vi; Touggourt, 5 ♀, vi; Constantine, 1 ♂, 1 ♀, vi. TUNISIA: Gabès, 1 ♂, 1 ♀, vi. LIBYA: Tripolitania, up to 800 m., 7 ♂, 8 ♀, v–xi. TURKEY: Ankara, 4 ♂, 3 ♀, viii; Tekirdağ, 1 ♂, 2 ♀, viii; Amasya, 1 ♂, viii; Rize, 3,200 m., 1 ♀, viii; Urfa, 11 ♂, 44 ♀, vii; Hatay, 3 ♂, 23 ♀, vii; Makkâri, 1,600 m., 3 ♀, viii; Seyhan, 1,500–1,900 m., 2 ♀, ix; Gasiantep, 1 ♀, —; Istanbul, 2 ♂, 6 ♀, vii–x; Zouguldak, 10 ♂, 2 ♀, viii; Muğla, 2 ♂, 1 ♀, vii; Manisa, up to 900 m., 11 ♂, 11 ♀, viii; İzmir, 7 ♂, 6 ♀, vii–viii; Denizli, 1,500–1,900 m., 2 ♂, 9 ♀, viii. SYRIA: Latakia, 13 ♂, 6 ♀, viii; Damascus, 1 ♂, vii; Tripoli-Homs, 3 ♀, vi. LEBANON: Hasbaya, 1 ♀, vi; E. of Beirūt, 2 ♂, 1 ♀, vii; Amyūn, 1 ♀, viii. ISRAEL: Samaria, 1 ♂, xi; Haifa, 1 ♂, 2 ♀, xi; Northern distr., 2 ♂, 5 ♀, vii–ix; Plain of Sharo, 5 ♀, ix; Southern distr., Negev, 1 ♂, 1 ♀, vii–viii; Southern distr., Beersheba, 5 ♂, 3 ♀, v–vii. JORDAN: E. Ramallah, 2 ♀, vi; El Ghor, Damiya, 6 ♂, 6 ♀, vi; Irbid-Mafraq

rd., 6 ♂, vi ; S. of Mafraq, 1 ♂, vi ; W. of El Salt, 3 ♂, 5 ♀, vi ; Wadi Shueib, 2 ♂, vi ; nr. Madaba, 1 ♂, viii. EGYPT : Lower Egypt, 1 ♀, — ; Lower Egypt, Faiyûm, 1 ♂, vii ; —, 2 ♀, vii–viii. IRAQ : Mesopotamia, Baghdād, 5 ♂, 3 ♀, vi–xii ; Mesopotamia, Mendali, 1 ♂, vii ; Kurdistan, 1 ♂, v. IRAN : Markazī, up to 2,100 m., 2 ♂; 7 ♀; vii–xi ; Hashtom, up to 2,400 m., 1 ♂, 2 ♀, v–x ; Sheshom, 5 ♂, 10 ♀, vii–ix ; Haftom, up to 1,800 m., 3 ♂, 5 ♀, v–vi ; Chahārom, up to 1,700 m., 1 ♂, 2 ♀, viii–x , Dovvom, 1 ♀, vii. AFGHANISTAN : Kabul, 900–2,500 m., 8 ♂, 49 ♀, vi–x ; Badakhshan, 1,800–2,900 m., 14 ♂, 89 ♀, vii–viii ; Eastern prov., Nuristan, 1,100–2,700 m., 6 ♂, 16 ♀, vii. W. PAKISTAN : Jammu and Kashmir, up to 2,600 m., 5 ♂, 7 ♀, ix–x ; Chitral, 4 ♂, 8 ♀, v–ix ; Baluchistan, 1 ♂, 2 ♀, vi–vii. BULGARIA : Sv. Vlas, 1 ♂, 1 ♀, viii. U.S.S.R. : Ukraina S.S.R., 2 ♂, 1 ♀, vii ; Kazakhstan S.S.R., 30 ♂, 34 ♀, v–ix ; Daghestan A.S.S.R., 1 ♂, 4 ♀, vii–viii ; Azerbaydzhan S.S.R., 1 ♀, vii ; Tadzhikistan S.S.R., up to 2,050 m., 1 ♂, 1 ♀, vii–viii ; Turkmeniya S.S.R., 1 ♂, 4 ♀, vi ; Armeniya S.S.R., 7 ♂, 42 ♀, vii–ix.

Calliptamus barbarus palaestinensis Ramme **stat. n.**

Calliptamus palaestinensis Ramme, 30.vi.1930, *Mitt. zool. Mus. Berl.*, **16** : 395 ; Bodenheimer, vii.1930, *Monogr. angew. Ent.* **10** : 62. [Holotype ♂, Israel, Palestine reg., Ben Shemen, 1925, (*F. Bodenheimer*) Berlin Mus.]

Calliptamus palaestinensis erythrocnemis Ramme, 1951, *Mitt. zool. Mus. Berl.* **27** : 313. [Holotype ♂, Syria, Beirūt, Nahr el Kelb, iii.1925 (*Müller*). Berlin Mus.] **Syn. n.**

DIAGNOSIS. See key, p. 332.

MEASUREMENTS	Males				Females		
	No.	Range	Mean		No.	Range	Mean
Head width	24	3·4–4·5	3·71	.	53	4·6–6·4	5·51
Femur length	24	9·4–14·2	10·82	.	52	15·0–22·0	18·05
Tegminal length	24	9·2–14·0	11·72	.	53	15·4–27·5	20·93
Total length	24	14·2–26·2	17.27	.	53	23·7–38·7	30·00

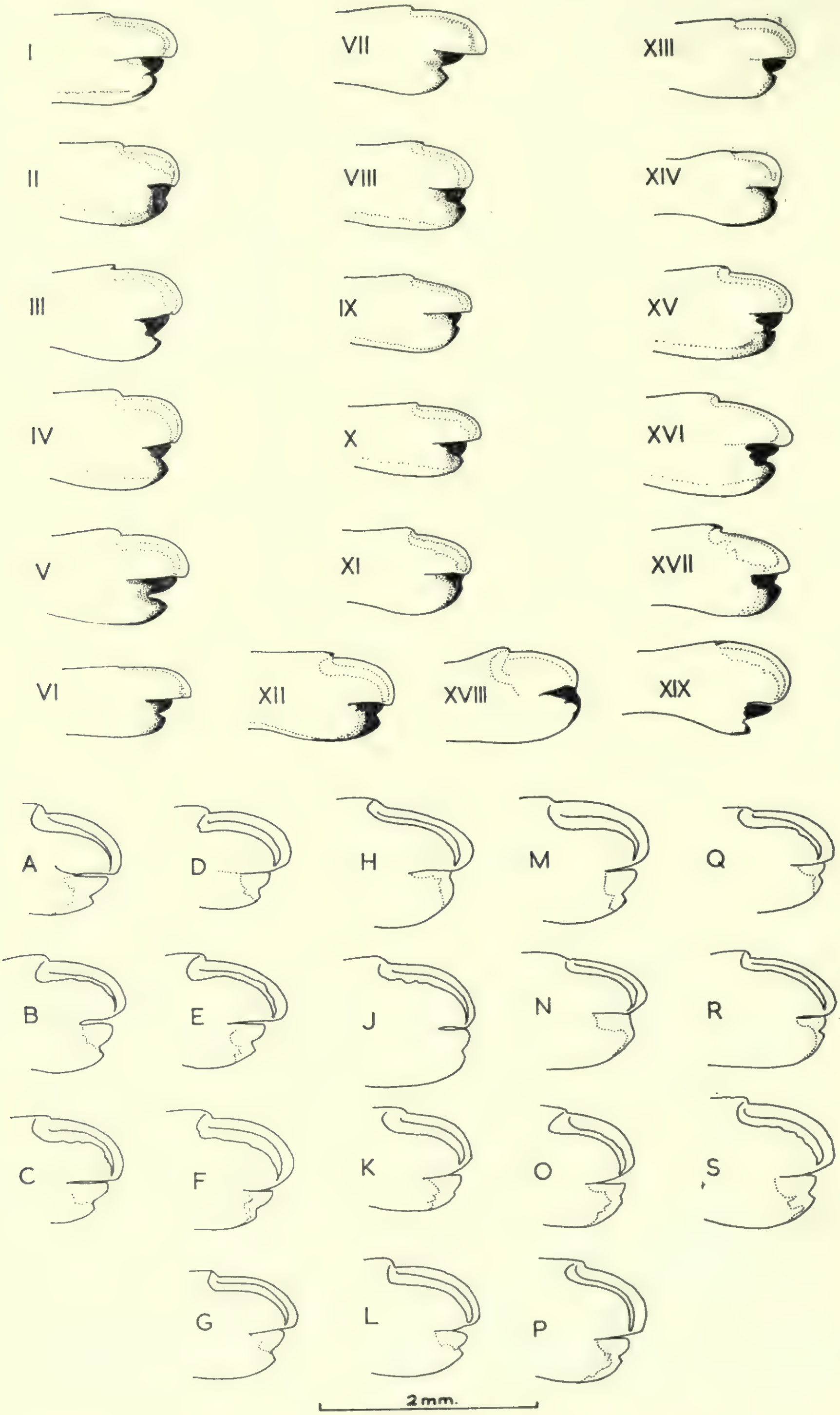
DISTRIBUTION. See key, p. 332.

MATERIAL EXAMINED. LEBANON : Laqlaq, 1,500 m., 11 ♂, 9 ♀, vii ; Bruāmān, 2 ♂, 2 ♀, vii ; (Intermediate forms) Beirūt, 2 ♂, 6 ♀, v–xii ; Baalbek, 2 ♀, vii. ISRAEL : Galilee, 1 ♂, xi ; Northern distr., 7 ♂, 5 ♀, x–xi ; Haifa, 1 ♂, 1 ♀, xi ; Jerusalem, 6 ♂, 20 ♀, vi–xi. JORDAN : El Ghor, Jericho, 1 ♀, x.

Calliptamus cyrenaicus **sp. n.**

DIAGNOSIS ♂. 1. Cingular valve elongate, membranous (Text-fig. 25 : G. p. 339), reaching well beyond tips of lateral accessory processes. Tip of aedeagus, as seen from above, narrower when compared with width of cingular arch than in *C. barbarus*, i.e. Cingular arch width/width of aedeagal valves, for *C. cyrenaicus* 1·97–2·20, mean 1·54 ; for *C. barbarus* 1·20–1·73, mean 1·46.

2. Lower apical cercus lobes tend to be reduced (Text-fig. 24 : I, II, VI. p. 336).


I
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2 mm.

3. Tegminal apices never surpassing knees of folded posterior femora. Distinctly tapered apically (Text-fig. 19 : A. p. 322).

4. Inner femoral spots separate, median spot rather large, square, nearly reaching lower inner carina. Posterior tibiae and inner side of posterior femora deep ruby to pale scarlet.

5. Anal fan pale to deep scarlet. Area anterior to this hyaline, colourless, with strongly pigmented brown veins. Well developed colour polymorphism (Text-fig. 19 : A–J. p. 322, and Text-fig. 20 : A–C. p. 324).

♀. Unlike sympatric *C. barbarus* never have solid black femoral spot. Sympatric *C. wattenwylianus* females differentiated on larger size, their measurements being as follows :

	No.	Range	Mean
Head width :	15	5·7–6·4	6·11
Femur length	15	19·5–22·5	20·73
Tegminal length	15	19·8–25·7	22·79
Total length	15	30·6–37·0	33·41

Measurements

	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width	9	3·6–4·1	3·83	21	5·1–5·9	5·44
Femur length	9	9·4–11·5	10·75	22	15·8–19·2	17·73
Tegminal length	9	9·9–12·0	11·07	21	15·0–20·8	18·32
Total length	9	15·1–18·1	16·91	21	23·2–30·2	27·19

Distribution. Only in Northern Libya (Cyrenaica).

Material examined. *Holotype* ♂, Libya, Cyrenaica prov., Slonta, Jebel Akhdar, 1.vii.1953 (*K. M. Guichard*), Brit. Mus. (nat. Hist.).

Paratypes, 2 ♂, 7 ♀, same data and depository.

Libya : Cyrenaica prov.; Slonta, Jebel Akhdar, 3 ♂, 7 ♀, 1.vii ; Shahhat, 500 m.,

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Fig. 24. Outer apical surface of left male cercus. (*a*) I. *C. cyrenaicus* sp. n. Libya, Cyrenaica prov., Tokra. (*b*) II, VIII, XI, XIV. *C. barbarus barbarus* (Costa) showing trends as those seen in *C. subalpinus* sp. n. (XVII). II. Morocco, Atlas mts., Ait Bou Guemmez, 6,000 ft. VIII. Spain, Segovia prov., Sierra da Guadarrama. XI. Spain, Santander prov., Picos de Europa. XIV. France, Puy de Dôme, 16 kms. S. of Le Puy. (*c*) III–VII, IX., XII, XIII, XV, XVI. *C. barbarus barbarus* (Costa). III. Morocco Moyen Atlas, Aguelman Sidi Ali Ou Mahommed, 6,500 ft. IV. Morocco, Moyen Atlas, Col du Zad, 2,000 m. V. Morocco, Rabat. VI. Algeria, Alger dep., Chrea, nr. Blida, 1,300 m. VII. Algeria, Ghardaïa dep., Djelfa. IX. Spain, Segovia prov., San Rafael. XII. France, Pyrénées–Orientales, Banyuls-sur-Mer. XIII. France, Pyrénées–Orientales, Vernets-les-Bains. XV. France, Hérault, Palavas-les-Flots. XVI. France, Provence prov., Var dep., Fréjus. (*d*) XVII. *C. subalpinus* sp. n. France, Alpes-Maritimes. (*e*) XIX. *C. plebeius* (Walker), Canary Islands, Gran Canaria I. (*f*) A–S. *C. wattenwylianus* (Pantel). France : A. Var, St. Maximin distr. B. Var, Méounes-les-Montrieux. C. Hérault, Montpellier. D. Pyrénées-Orientales, Banyuls-sur-Mer. E. Pyrénées-Orientales, Vernets-les-Bains. Spain : F. Gerona prov., Port Bou, Cataluna. Libya : G. El Marj and Slonta. Morocco : H. Tangier and Ras el Muar. J. Rabat. K. Moyen Atlas, Timhadit, 5,000 ft., L. Moyen Atlas, Timhadit and Mouldirt, M. Atlas Mts., Ait Bou Guemmez, 6,000 ft. N. Mouldirt (and Algeria : Volgrove). O and P. Atlas Mts., Ait Bou Guemmez, 6,000 ft. Algeria : Q. Oran dep., Mascara. R. Oran dep., Mascara ; and Alger dep., Boghari. S. Alger dep., Boghari. (*g*) XVIII. *C. siciliae* Ramme.

1 ♂, 22.x. and 28.ix; Shahhat to Tokra, 3 ♂, 1.x; Derna, 200 m., 2 ♂, 3 ♀, 23.ix; Saff Saff, 2 ♀, 26.ix; Latrun, 10 km. E. of Ras Hilal, 1 ♀, 8.iv. (*A. F. Sladden, I. A. D. Robertson, K. M. Guichard*). All in Brit. Mus. (Nat. Hist.).

DISCUSSION. Probably evolved from *C. barbarus* (see discussion, p. 292).

Calliptamus subalpinus sp. n.

Calliptamus ictericus Serville, auctt. (misidentification).

DIAGNOSIS ♂. 1. Rather short, weak, apically outcurved penis valves (Text-fig. 25: E. p. 339). Lateral accessory processes of penis valves similar to *C. barbarus* (Text-fig. 10: E. l). Orientation of aedeagus as in latter species (Text-fig. 3: T. p. 296). Cingular valve with its apex level with a line drawn to touch posterior apices of lateral accessory processes of penis valves.

2. Cercus apex variable but ranging from that shown in Text-fig. 24: XVII. p. 336, to that of *C. siciliae* (Text-fig. 24: XVIII). Usually near second type.

3. Tips of folded tegmina never surpassing knees of folded posterior femora. Tegmina tapered in apical 2/3.

4. Darkly coloured; pronotum type E (Text-fig. 19. p. 322). Little colour polymorphism.

5. Posterior femora with three separate black or dark brown inner spots, middle spot usually largest. Often paralleling *C. italicus* very closely at high altitude. Spots may be faintly pigmented, with little black pigment below upper inner carina.

6. Posterior tibiae dull ruby-red to red; this colour also on lower inner femoral carinae.

7. Hind wings colourless or flushed with pink basally (polymorphs distributed at random geographically).

♀. For separation from other sympatric *Calliptamus* spp. see pp. 318 and 328; also key p. 310. *C. wattenwylianus* never occurs above 500 metres, and never has colourless hind wings. A larger insect (compare measurements, p. 323 with those below). *C. subalpinus* and *C. siciliae* females inseparable except on distribution.

MEASUREMENTS	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width	85	3·1–3·7	3·34	147	4·1–5·3	4·71
Femur length	85	7·6–10·5	9·12	147	13·4–16·9	15·37
Tegminal length	85	6·4–11·3	8·77	147	13·7–19·9	16·80
Total length	85	10·8–16·9	13·72	147	20·6–28·6	24·98

DISTRIBUTION. Present in the Maritime Alps and south-eastern France (up to 1,200 metres), it is unable to penetrate the southern Italian Alps, but occupies the higher Ligurian Alps and the Italian peninsula south of the Po valley. (Text-fig. 6, p. 301).

MATERIAL EXAMINED. *Holotype* ♂, FRANCE, Alpes Maritimes, Valdeblor St. Roch, 1,120 m., 5. viii. 1958, (*N. D. Jago*). Brit. Mus. (nat. Hist.)

Paratypes, 23 ♂, 10 ♀, same data and depository.

FRANCE: Alpes Maritimes; Biot, 200 m., 1 ♂, 2 ♀, viii; Le Rouret, 300 m., 20 ♂, 19 ♀, 12.ix; Sarre valley, 600 m., 19 ♂, 39 ♀, ix; St. Martin-Vésubie, 21 ♂, 34 ♀, ix; St. Dalmas de Tende, 1,100 m., 9 ♂, 9 ♀, 5.viii; Valdeblor St. Roch, 1,120 m., 24 ♂, 11 ♀, 5.viii; Thorenc, 7 ♂, 20 ♀, ix; Le Souquet, 2.ix — Var; Bagnols, 19 ♂, 16 ♀, x; Méounes-les-Montrieux, N. of Toulon, 1 ♂, 2 ♀, 1.ix; Montouroux, 350 m., 4 ♂,

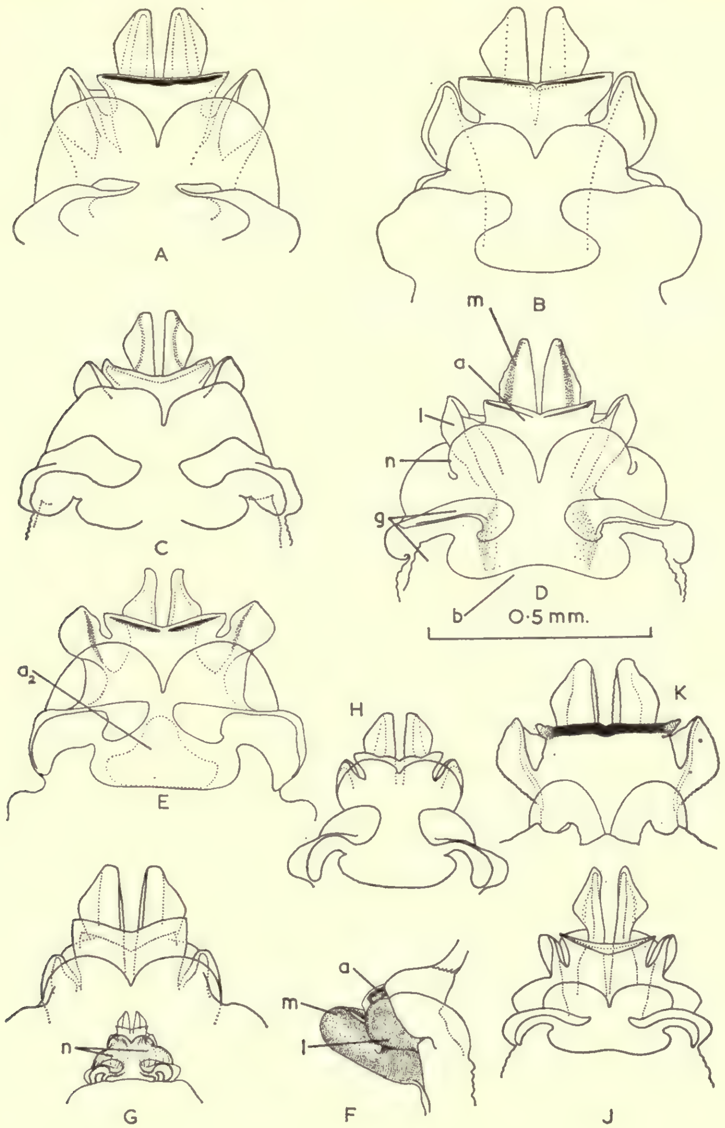

FIG. 25. Apical part of phallic complex in males of " *barbarus* " complex. All diagrams show dorsal aspect, except F. which shows view from right side. (*a*) A–D, F, and H. *C. barbarus barbarus* (Costa) : A. Topotype, Italy, nr. Napoli, Ponte de Mare. B. Spain, Segovia prov., Sierra de Guadarrama. C. Jordan, W. of El Salt, Khor Kabid, D. Jugoslavia, Srbija reg., Deliblatski sands, Pannonia. F. Jordan, W. of El Salt, Khor Kabid. H. West Pakistan, Jammu and Kashmir state, Srinagar, 3,500 ft. (*b*) E. *C. subalpinus* sp. n. France, Alpes–Maritimes, Valdeblor. (*c*) G. (and inset showing cingular pouches) —*C. cyrenaicus* sp. n., Libya. (*d*) J. *C. barbarus palaestinensis* Ramme, Lebanon. (*e*) K. *C. siciliae* Ramme, Sicily.

23 ♀, x : (*N. D. Jago, M. Korsakoff, D. R. Ragge, B. P. Uvarov*). Brit. Mus. (Nat. Hist.). ITALY : Genova, Chippiato, 6 ♂, 3 ♀, 6.x and 11.ix ; Liguria, Chiavari, 1 ♂, 1 ♀, ix ; Toscana, Stiava, nr. Viareggio, 1–40 m., 1 ♂, 3 ♀, 16.ix ; Potenza, Varco di Pietrastretto, nr. Potenza, 850 m., 1 ♂, 3 ♀, 26.ix ; Basilicata, Venosa, 420 m., 1 ♀, 30.ix ; Cosenza, Calabria, 1 ♂, x ; Cosenza, Cozzadi Mantiella, 1 ♂, 3 ♀, 31.viii ; Roma, st. Vito Zanon, 1 ♂, 1 ♀, —; Puglie, Maglie, 70 m., 30 ♂, 29.ix ; Salentina pen., Taranto, Martina Franca, 1 ♂, 9.ix ; Bari, Murgia, Serraficaia mt., 1 ♀, 11.ix ; Lucania, Atella, 2 ♂, 12.vii ; Bari, Altamura, Murgia Parisi, 1 ♀, 22.vi. (*F. Capra, M. Salfi, F. E. Zeuner*). Representatives in Brit. Mus. (Nat. Hist.).

DISCUSSION. This species cannot take the name *C. ictericus* (for discussion see p. 332). Although very close to *C. siciliae*, the species differs in the form of the penis valves. The species is probably derived from *C. barbarus*, many of whose upland populations in Spain and France show similar external facies.

Calliptamus siciliae Ramme, **stat. n.**

Calliptamus abbreviatus siciliae Ramme, 1927, *Eos*, **3** : 166. [Lectotype ♂, Sicilia, Messina prov., nr. Messina, Colle S. Rizzo, 2–400 m., 27.vii.1924 (*Ramme & Richter*) Berlin Mus. Only types studied.]

DIAGNOSIS ♂. 1. Penis valves with widest part exposed beyond posterior edge of cingular valve (cf. Text-fig. 25 : K. p. 339). Other characters as for *C. subalpinus* (diagnosis, p. 338).
♀. Separable only on distribution. Otherwise like *C. subalpinus*.

MEASUREMENTS	Males			Females		
	No.		Mean	No.		Mean
Head width	2	3·3 and 3·6	3·45	2	4·9 and 5·2	5·05
Femur length	2	9·2 and 10·1	9·65	2	16·5 and 17·8	17·15
Tegminal length	2	8·0 and 8·6	8·30	2	16·1 and 18·1	17·10
Total length	2	12·8 and 14·2	13·50	2	24·7 and 27·8	26·25

DISCUSSION. A lectotype has been chosen from Ramme's syntypes, and is now returned to Berlin Museum. The small amount of material may indeed mean that these genitalia are atypical, in which case *C. subalpinus* must be synonymized with *C. siciliae*.

Calliptamus tenuicercis Tarbinsky, 1930

Calliptamus tenuicercis Tarbinsky, 1930, *Bull. Acad. Sci. U.R.S.S.* : 180. [Holotype ♂, Iran Chahārom prov., Gandzha, 2.viii.1928, (*Tarbinsky*). Leningrad Mus.]

Calliptamus iranicus Ramme, 1930, *Mitt. zool. Mus. Berl.*, **16** : 395. [Syntypes 22 ♂, 27 ♀, Azerbaidjan, Ordubad, 3.viii.1927 ; Armenia prov., Ecmiadzin, 20.viii.1927 ; Alagos, 12–800 m., 25.viii.1927. Berlin Mus.]

Calliptamus iranicus aurantiacus Ramme, 1930, Ibid. [Unspecified number of syntypes, Tiflis to Mzchet. Berlin Mus.] **Syn. n.**

Calliptamus persa Uvarov, 1938, *Ann. Mag. nat. Hist.*, (11), **1** : 371. [Holotype ♂, Iran, Seshom prov., Masjed-Solēyman, nr. Ahvaz, vi.1937, (S.V.P. Pill). Brit. Mus. (nat. Hist.).] **Syn. n.**

Calliptamus tenuicercis iracus Mařan, 1951, *Sbor. ent. Odd. nár. Mus. Praze*, **27** : 384. [Holotype ♂, Iraq, Mesopotamia reg., Baghdad, (*Kalalova*). National Mus., Prague.] **Syn. n.**
Calliptamus tenuicercis syriacus Ramme, 1951, *Mitt. zool. Mus. Berl.*, **27** : 310. [Syntypes 1 ♂, 3 ♀, Syria, (*Ehrenberg*). Berlin Mus.] **Syn. n.**

DIAGNOSIS ♂. 1. Weak pointed penis valves (Text-fig. 15 : E and F. p. 315), almost vertically orientated, nearly hidden by cingular valves from above (Text-fig. 15 : E. a). Lateral accessory expansions of penis valves auricular, hiding all but tips of penis valves when viewed laterally (Text-fig. 15 : D, m. p. 315). Cingular valve thick and flattened apically (Text-fig. 15 : F, a. p. 315). Dorsal ectophallic plate broader than long ; posterior median lobe laminar and upturned. *C. coelesyriensis* differentiated by shape of cingular arch, cingular valve, and dorsal ectophallic membrane (Text-fig. 16 : C, c. p. 317).

2. Cercus (Text-fig. 17 : H, J. p. 319) with apical lobes usually well differentiated. Ratio of length to maximum depth near apex, 4·0 plus (like *C. barbarus*, but see *C. balucha*, p. 342).

3. Tegmina with apices level with, or falling short of, (occasionally surpassing) knees of folded femora. Rs with up to 4 branches.

4. Posterior femora yellow on inner side ; often dull pale ruby between inner carinae. Inner femoral spots separate to fused, if completely so then no orange and grey-ruby pigment just posterior to black area (cf. *C. barbarus* p. 314 ; see Text-fig. 22 : B. p. 330).

5. Posterior tibiae yellow, pale dull orange or orange.

6. Hind wings ruby in basal $\frac{1}{3}$ to $\frac{1}{2}$—rest colourless with darker veins.

7. Tegminal colouring as for *C. barbarus* ; "*marginellus*" forms common.

♀. For separation from *C. barbarus* see pp. 314, 328 and 331.

MEASUREMENTS	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width . .	99	3·2–4·8	3·92	115	3·9–6·2	5·17
Femur length . .	99	8·2–15·6	11·75	110	12·0–22·0	17·02
Tegminal length .	99	9·0–20·7	14·59	111	13·6–38·7	21·40
Total length . .	99	13·5–28·2	20·39	111	20·2–38·8	30·23

DISTRIBUTION. See Text-figs. 8 and 9, pp. 304 and 305 respectively. The species inhabits an area where mean annual rainfall is generally less than 25 in. It thus penetrates semi-desert environments more deeply than does *C. barbarus* which is less xerophilous.

MATERIAL EXAMINED. TURKEY : Ankara, 5 ♂, 8 ♀, viii ; Antalya, 5 ♂, 6 ♀, — ; İstanbul, 1 ♂, 1 ♀. viii ; Seyhan, 1 ♀, — ; Urfa, 4 ♂, 27 ♀, vii ; Niğde, 1,300 m., 2 ♀, ix ; all following *var. aurantipes* Mersin, 1,900 m., 10 ♀, viii ; Denizli, 1,280 m., 1 ♂, viii ; Hatay, 1 ♀, viii. LEBANON : Bekaa Bega, 1 ♂, vii. ISRAEL : Northern distr., 3 ♂, 2 ♀, iv ; E. of Nablus, 1 ♂, v ; Southern distr., Negev, 4 ♂, 2 ♀, vii. JORDAN : Ain el Basha, 1 ♂, vi ; El Ghor, 16 ♂ 10 ♀, vi ; Irbid-Mafraq rd., 1 ♂. 1 ♀, vi ; nr. El Salt, 9 ♂, 8 ♀, vi ; Wadi Shueib, 10 ♂, 6 ♀, vi. IRAQ : Mesopotamia, Baghdād, 1 ♂, 1 ♀, vi. IRAN : Chahārom, 2 ♂, 2 ♀, viii–ix ; Marhazī, 1 ♂, 5 ♀, vi–ix ; Dovvom, 1 ♂, vi ; Hashtom, 8 ♂, 6 ♀, iii–x ; Haftom, up to 2,500 m., 1 ♂, ix ; Seshom, 14 ♂, 9 ♀, vi. AFGHANISTAN : Kabul, 2,400 m., 2 ♂, 1 ♀, vii. U.S.S.R.: Armeniya S.S.R., 2 ♂, 2 ♀, vii–ix ; Azerbaydzhan S.S.R., 1 ♂, 1 ♀, vii ; Daghestan A.S.S.R., 2 ♂, 5 ♀, viii ; Gruzija S.S.R., 1 ♂, 1 ♀, v.

DISCUSSION. Phallic morphology is very uniform throughout the range of distribution of this species, colour variation being explicable on the same arguments as those used for *C. barbarus* (pp. 301–306). The new synonyms are based on material

which all belongs to the orange-legged populations in the east of the range (see Text-fig. 22 : B, p. 330). The species seems most closely related to *C. balucha* and *C. coelesyriensis*.

Calliptamus balucha Uvarov, 1938

Calliptamus balucha Uvarov, 1938, *Ann. Mag. nat. Hist.* (11), **1** : 371. [Holotype ♂, West Pakistan, Baluchistan reg., Ziarat, 8,000 ft., 6.viii.1929, (*J. W. Evans*) Brit. Mus. (Nat. Hist.).]

DIAGNOSIS ♂. I. Penis valves of lowland forms like *C. tenuicercis* (Text-fig. 15 : G–J), but in montane forms (above 2,000 m., e.g. Chitral and N.W.F. prov., W. Pakistan) more like *C. barbarus* (Text-fig. 15 : A–C. p. 315). Epiphallus ratio of width across lower corners to depth at centre never more than 2·0 (*C. tenuicercis*, ratio 2·1–2·9). Epiphallus heavily sclerotized (Text-fig. 15 : N).

2. Cercus (Text-fig. 17 : H, J. p. 319) with ratio of length to maximum depth at distal end never more than 3·8 (range 3·30–3·60), cf. *C. tenuicercis*, p. 341.

3. Tegminal apices never surpassing knees of folded posterior femora. Often so reduced that apices do not reach middle of folded posterior femora (extreme montane forms).

4. Inner posterior femoral colour dull greyish ruby to pale ruby-red. Black femoral spots separate ; median largest and often diffuse.

5. Posterior tibiae dull greyish ruby to pale ruby-red.

KEY TO SUBSPECIES

1. Penis valves (Text-fig. 15 : J, m. p. 315) relatively weak. Cingular valve like *C. tenuicercis* (cf. Text-fig. 15 : H, a and F, a. p. 315) its width apically being well over half width across outer edges of lateral processes of penis valves. Penis valves half hidden by lateral accessory processes from side view (Text-fig. 15 : J. p. 315). Tegminal length to femoral length ratio, ≏0·96 ♂, never less than 1·0 in ♀
balucha balucha Uvarov (p. 342)

–. Penis valves (Text-fig. 15 : A–C, m) relatively strongly developed, reminiscent of *C. barbarus* (Text-fig. 25 : F. p. 339). Cingular valve only just wider apically than half width across outer edges of lateral accessory processes (Text-fig. 15 : A, 1). Penis valves clearly visible in lateral view, hardly hidden by lateral accessory processes (Text-fig. 15 : C). Penis valves with flattened and moderately outwardly expanded upper edges (Text-fig. 15 : B, m). Tegminal length ratio 0·62–0·92 ♂, 0·66–0·96 ♀ . . . . **balucha brachypterus** (Dirsh) (p. 343)

Calliptamus balucha balucha Uvarov

[Type as for species, above.]

DIAGNOSIS. See key.

MEASUREMENTS	Male		Females		
	No.		No.	Range	Mean
Head width	1	3·7	9	4·6–5·6	5·13
Femur length	1	9·1	9	12·7–17·4	15·06
Tegminal length	1	8·8	9	12·7–19·8	16·87
Total length	1	14·2	9	20·6–29·1	25·00

DISTRIBUTION. See Text-fig. 8, p. 304. Probably found throughout hills of West Pakistan ; not below 1,000 m. A montane subspecies with intermediates with subsp. *brachypterus* (Dirsh) at Kabul River.

MATERIAL EXAMINED. W. PAKISTAN : Baluchistan, up to 2,300 m., 1 ♂, 8 ♀, vi–viii.

DISCUSSION. Easily separable from all sympatric species, e.g. *C. italicus* (montane form), *C. barbarus barbarus* (orange-legged form), *C. coelesyriensis coelesyriensis* (semi-desert form), and *C. tenuicercis* (extreme semi-desert form) (see key, p. 314).

Calliptamus balucha brachypterus (Dirsh) **stat. n.**

Metromerus brachypterus Dirsh, 1957, *Atti. Mus. Stor. nat. Trieste*, **21** (2) : 44. [Holotype ♂, W. Pakistan, Chitral reg., Birir, 2,300 m., viii.1955, (*A. Marussi*). Trieste Mus.]

DIAGNOSIS. See key, p. 342.

MEASUREMENTS	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width	8	3·6–4·0	3·81	25	4·6–6·1	5·26
Femur length	8	9·2–10·8	9·84	25	13·2–16·9	15·25
Tegminal length	8	5·6–9·1	7·60	25	10·0–16·0	13·47
Total length :	8	11·2–15·7	13·48	25	18·7–25·8	22·02

DISTRIBUTION. See Text-fig. 8, p. 304. Chitral and Kabul River systems up to 2,400 m.

MATERIAL EXAMINED. AFGHANISTAN : Kabul, 1,600–2,400 m., 6 ♂, 22 ♀, x. W. PAKISTAN : Chitral, 2,300 m., 3 ♂, viii.

Calliptamus coelesyriensis (Giglio-Tos), **comb. n.**

DIAGNOSIS ♂. 1. Lateral expansions of penis valves broad and auricular, hiding or partly hiding penis valves from view laterally (Text-fig. 16 : p. 317). Zygoma with unique inflated posterior expansions (Text-fig. 16 : A, g). Dorsal ectophallic membrane plate with unique, erect sclerotization on median posterior edge (Text-fig. 16 : C, c).

2. Cercus with lower apical lobe usually undivided (Text-fig. 17 : N, O. p. 319). Subsp. *hissaricus* however often has separate median apical lobe.

3. Tegmina with 2 or 3 branches of Rs. Noticeable concavity in membrane between Cu_1 and Cu_2 (between Cu_{1b} and Cu_{1c}).

4. Melanic forms common. Buff tegmina peppered with darker pigment (like *C. italicus* in E. Iran), darker highland forms from Turkey and Afghanistan with coarser spotting.

5. Inner side of posterior femora a pale shade of general body colour ; three separate brown spots (often faint, replaced by deep pink or absent), not extending on to upper side of femur. Lower inner carina and adjacent area pale ruby pink or greyish pink (Text-fig. 17 : P, Q, S, U. p. 319, cf. *C. italicus*, Text-fig. 2).

6. Posterior tibiae some shade of pale ruby ; intense on outer side. Infusions of melanic pigment gives mauve appearance.

7. Hind wings with pale ruby flush in whole of anal fan.

♀. For differentiation from *C. italicus* see p. 314. If median femoral spot well developed, then

posterior spot subequal, Text-fig. 17 : S. p. 319 ; in *C. balucha* median spot always larger. Other colour characters as for male.

DISTRIBUTION. Similar to *C. tenuicercis* but with greater extension north eastwards (as subsp. *hissaricus*), see Text-figs. 8 and 9, pp. 304, 305. Does not enter Negev desert in Israel or N. Turkey.

DISCUSSION. For synonymy of *Metromerus* see introduction, p. 300. Subsp. *angustus*, defined partly on the narrowness of fastigium verticis in the male, cannot be separated on this character (see Text-fig. 17 : A–C. p. 319 showing range of variability from one locality). It seems to be an upland form of the species with many facies of a montane form (see p. 304).

KEY TO SUBSPECIES

MALES

1. Penis valves flattened and appressed to cingular valve (Text-fig. 16 : D, B, m. p. 317). Epiphallus (Text-fig. 14: G. p. 313) thickened uniformly in centre, without cruciform or narrowly parallel thickening (cf. Text-fig. 14 : A, B, D. p. 313)
coelesyriensis hissaricus (Mishchenko) (p. 345)
NE. IRAN ; NE. AFGHANISTAN ; TADZHIKSKAYA REP., U.S.S.R.

–. Penis valves small, pointed (Text-fig. 16 : E, m), orientated with their flat surfaces in a plane parallel with long axis of body ; valves wholly or partly hidden from side by auricular accessory penis valve processes. Never with a median apical cercus lobe 2

2. Black except for deep ruby-black tibial colour
coelesyriensis coelesyriensis (ab. **carbonaria** Uvarov) (p. 344)

–. Colouring light brown or buff with fine tegminal speckling, or darker brown with bolder tegminal markings. Epiphallus Text-fig. 14 : A, B, D. p. 309
coelesyriensis coelesyriensis (Giglio–Tos) (p. 345)
ISRAEL ; JORDAN VALLEY ; SYRIA ; IRAQ ; IRAN ; S. TURKMENSKAYA REP., U.S.S.R., W. AFGHANISTAN ; W. PAKISTAN ; TURKEY.

Calliptamus coelesyriensis coelesyriensis (Giglio–Tos), comb. n.

Caloptenus coelesyriensis Giglio-Tos, 1893, *Bull. Mus. Anat. comp. Torino*, VIII, **164** : 10–11. [Holotype ♂, Syria. Turin Mus.]

Calliptamus italicus ab. carbonaria Uvarov, 1914, *Rev. russe Ent.*, **14** : 226. [Holotype ♂, Turkey, Ordubad prov., nr. Eriwan, 1.vi.1911, (*K. A. Saturnin*).]

Kripa coelesyriensis angustus Uvarov, 1934, *Eos*, **10** : 118, Text-fig. [Holotype ♂, Turkey, Ankara prov., Ankara, 10.viii.1931, (*B. P. Uvarov*) Brit. Mus. (nat. Hist.).] **Syn. n.**

Calliptamus tenuicercis anatolicus Mařan, 1951, *Sbor. ent. Odd. nár. Mus. Praze*, **27** : 384. [Holotype ♂, Turkey, Ankara Baraj, (3–4). vii.1947. Nat. Mus. Prague.] **Syn. n.**

Metromerus coelesyriensis intricatus Mishchenko, 1951, in G. Beĕ-Bienko & L. L. Mishchenko : *Opred. Faune S.S.S.R.*, **40** : 261. [Holotype ♂, Turkmeniya S.S.R., Oschek, Kopyet Dag, nr. Gollbeck, (21–23). v.1913. Leningrad Mus.] **Syn. n.**

DIAGNOSIS ♂. See key, above. Narrow zone of intergrading phallic types with subsp. *hissaricus* (see Text-fig. 8 and Text-fig. 16 : H, J).

♀. Use colour characters (see keys, pp. 314 and above).

MEASUREMENTS	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width :	87	3·5–4·7	4·53	214	4·2–6·0	5·09
Femur length	82	9·0–14·3	11·54	209	12·1–21·0	16·12
Tegminal length	84	8·6–20·4	13·56	212	11·6–27·4	18·39
Total length	83	14·4–28·1	19·86	216	17·5–38·1	27·14

DISTRIBUTION. See Text-fig. 8, p. 304, and discussion below.

MATERIAL EXAMINED. TURKEY : Ankara, 3 ♂, 3 ♀, vii–viii ; Antalya, up to 1,900 m., 2 ♂, 36 ♀, vii ; İsparta, up to 1,700 m., 9 ♂, 19 ♀, vii ; Seyhan, up to 1,900 m., 1 ♂, 4 ♀, ix ; Maras, up to 2,000 m., 2 ♂, 1 ♀, vii ; Muğla, up to 1,800 m., 9 ♀, 9 ♀, vii ; Denizli, up to 1,900 m., 10 ♀, viii ; Urfa, 4 ♂, 6 ♀, vii. SYRIA : Damascus, 1 ♂, 6 ♀, vii ; Tekieh, 2 ♂, 3 ♀, vii ; Jebel Maza, 1 ♀, vii ; En Nebk, 1 ♀, iv ; Aleppo, 1 ♀, iv–vii. ISRAEL : Jerusalem, 1 ♂, v ; Southern distr., Beersheba, 1 ♀, v. JORDAN : El Ghor, 2 ♂, 1 ♀, iv ; E. of Hebron. 1 ♀, v ; Jerusalem to Jericho, 1 ♂, 8 ♀, iv–v ; Khor Fasyll, 6 ♂, 4 ♀, iv ; Wadi Shueib, 1 ♂, 3 ♀, iv ; Wadi Keld, 1 ♂, 1 ♀, v. IRAN : Dovvom, 22 ♂, 19 ♀, v–vii ; Haftom, 7 ♂, 7 ♀, v ; Markazī, 5 ♂, 13 ♀, vii–ix ; Hashtom, 7 ♂, 8 ♀, iv–vi ; Dahom, 2 ♂, 1 ♀, vi. U.S.S.R. : Kazakhstan S.S.R., 2 ♀, ix ; Armeniya S.S.R., 7 ♂, 7 ♀, vi ; Turkmeniya S.S.R., 1 ♂, 1 ♀, v.

DISCUSSION. Two main forms occur, a pale buff semi-desert type with melanic forms (increasing in proportion north eastwards), and smaller, dark coloured upland forms which often display var. *marginellus*. The two forms intergrade over a broad zone.

Calliptamus coelesyriensis hissaricus (Mishchenko) **comb. n.**

Metromerus coelesyriensis hissaricus Mishchenko, 1951, in Beĕ-Bienko and L. L. Mishchenko, *Opred. Faune S.S.S.R.*, **40** : 261. [Holotype ♂, U.S.S.R., R. Khozov-Mer, Ober Eeskander-Komya, viii.1947 (A. Kerichenko). Leningrad Mus.].

DIAGNOSIS. See key to subspecies, p. 344. Inner side of posterior femora usually deep blackish ruby to maroon. Inner femoral spots separate, median spot largest, often diffuse (Text-fig. 17 : T. p. 319).

MEASUREMENTS	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width :	11	2·5–4·1	3·75	6	4·1–5·2	5·00
Femur length	11	7·7–11·8	10·73	6	10·3–17.8	16·02
Tegminal length	11	8·9–14·4	12·85	6	13·0–25·9	21·13
Total length	11	14·7–20·2	18·66	6	18·4–34·4	29·28

DISTRIBUTION. See Text-fig. 8, p. 304. Found in tributaries of Amu Darya R. system, NE. Iran, and probably Golodnaya Step' eastwards (S. Turkmeniya, and Tadzhikstan, S.S.R.).

MATERIAL EXAMINED. IRAN : Dovvom, Shahrud, 6 ♂, 4 ♀, v–vi. AFGHANISTAN : Badakhshan, Shiva and Senna, 1,800–2,800 m., 4 ♂, 1 ♀, vii. U.S.S.R. : Type and allotype.

DISCUSSION. For resemblance to *Indomerus* see p. 297. The subspecies shows a narrow belt of intermediates with the nominate subspecies in NE. Iran (see Text-fig. 16 : H, J. p. 317 for intermediate phallic types).

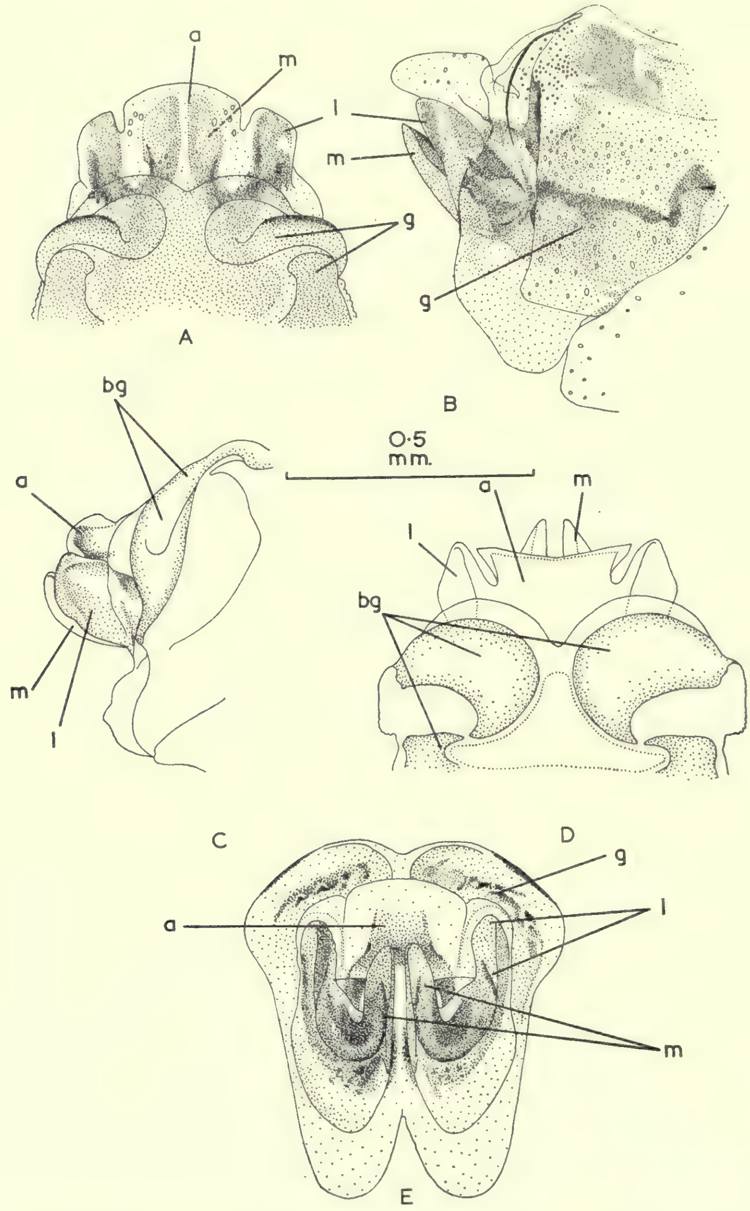

FIG. 26. Apical portion of phallic complex in *C. plebeius* (Walker) (A. dorsal, B. lateral, and E. posterior aspects) and *C. madeirae* Uvarov (C. lateral and D. dorsal aspects).

Calliptamus plebeius (Walker, 1870)

Heteracris plebeia Walker, 1870, *Catalogue of the Specimens of Dermaptera Saltatoria in the British Museum*, **4** : 673. [Holotype ♀, Canary I., Brit. Mus. (nat. Hist.). Descriptions based on male plesiotype, Gran Canaria I., Fataga, viii.1931 (H. B. Cott). Same depository.]
Caloptenus vulcanius Krauss, 1892, *Zool. Anz.*, **15** : 167. [Unknown No. of syntypes ♂♀, Canary Is., Tenerife, Palma, Gran Canary, Hierro. Vienna Mus.]

DIAGNOSIS ♂. 1. Genitalia rather membranous (Text-fig. 26 : A, B, and E. p. 346). Penis valves membranous, hidden by membranous cingular valve from above. Valves not hidden from side by lateral accessory processes ; cingular valve weakly sclerotised, with flat obliquely sloping posterior surface. Cingular arch covering base of aedeagus not constricted behind valves (cf. *C. tenuicercis*), its posterior edge rising vertically (not obliquely as in *C. madeirae*, p. 348).

2. Cercus unique ; upper lobe very broad, lower apical lobes weak and divergent (Text-fig. 24 : XIX. p. 336).

3. Tegmina always surpassing knees of folded posterior femora.

4. Colour polymorphism as *C. barbarus* but all forms much darker.

5. Inner side of posterior femora yellow to orange-red or red. Inner femoral spots always fused. Hind femora narrow for genus (except *C. madeirae*, where just as narrow), i.e. length to depth ratio never less than 3·6 ; rest of genus 2·85–3·67.

6. Posterior tibiae yellow to orange-red, to red. Spines rather elongate.

7. Hindwings colourless, hyaline, slightly infumate.

8. Lateral pronotal carinae straight, diverging uniformly backwards. Never converging in last ¼ of their length.

♀. As for male.

MEASUREMENTS	Males			Females		
	No.	Range	Mean	No.	Range	Mean
Head width	8	3·0–3·7	3·53	46	4·1–4·9	4·48
Femur length	8	9·5–12·8	11·49	46	15·2–18·5	16·81
Tegminal length	8	13·1–18·0	14·90	46	21·6–25·7	23·94
Total length	8	17·8–24·1	22·63	46	29·2–34·8	31·30

DISTRIBUTION. Found on Gran Canaria, Hierro, and Tenerife in the Canary group, and probably other islands. Localities from sea level to 4,000 ft.

MATERIAL EXAMINED. GRAN CANARIA I. : Fataga, Las Palmas, Caldera Bandana, 13 ♂, 56 ♀, viii–ix.

HIERRO I. : El Golfo, 1 ♂, viii. TENERIFE I. : 1 ♀, —.

DISCUSSION. Can live on very arid lava slopes among sparse vegetation. Shows all colour polymorphs over a very small area of distribution. Misidentified as *Caloptenus italicus* by Heyden (1872) and *C. barbarus* by Ramme (see p. 334 for reference to Willemse, 1936).

Calliptamus madeirae Uvarov, 1937

Calliptamus madeirae Uvarov, 1937, *Ark. Zool.*, **29**, A(15) : 4. [Holotype ♂, Madeira, Funchal, (27–30).ix.1910. Stockholm Mus.]

DIAGNOSIS ♂. 1. Lateral accessory processes of penis valves expanded, almost hiding penis valves from view laterally (Text-fig. 26 : C, D. p. 346). Cingular valve as in *C. barbarus*, not

elongate, inflated, or membranous. Cingular arch unique, with two gently sloping lobes at its posterior end (Text-fig. 26 : C, b and g), posterior edge of arch not being inflated in any way.

2. Cercus as in *C. barbarus* ; apical lobes separate.
3. Tegminal size as in *C. plebeius*.
4. Colour forms as in *C. plebeius* and *C. barbarus*.
5. Inner femoral spots as in *C. plebeius*. Lower inner carina dull ruby-red, or buff body colour.
6. Posterior tibiae dull ruby-red, never yellow.
7. Hind wings suffused with pink on anal fan.
8. Pronotal morphology as in *C. plebeius*.

♀. Diagnostic features as for males.

Measurements	Male		Females		
	No.		No.	Range	Mean
Head width	1	3·4	10	4·5–5·1	4·73
Femur length	1	10·3	10	16·1–19·6	17·57
Tegminal length	1	14·2	10	21·4–28·0	24·20
Total length	1	19·6	10	29·5–37·4	32·63

Distribution. Known only from Madeira Island.

Material examined. Madeira I. : Various localities up to 1,200 m., 1 ♂, 7 ♀, viii–x.

Discussion. The species may have evolved from *C. barbarus* due to chance introduction from the Iberian peninsula, i.e. *C. plebeius* may have been derived similarly from N. Africa.

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A STUDY OF THE TYPES OF SOME LITTLE-KNOWN GENERA OF DIASPIDIDAE WITH DESCRIPTIONS OF NEW GENERA (HEMIPTERA : COCCOIDEA)

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AND
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SYNOPSIS

Although the type species of most genera of the Diaspididae are now known, there are a few still almost completely unknown since their original descriptions.

In all, the type species of 28 genera of which 8 are new are discussed and illustrated, and they are distributed in different tribes as follows: Diaspidini 15; Parlatoriini 4; Aspidiotini 9.

INTRODUCTION

One of the main difficulties affecting the study of the Coccoidea is the insufficient knowledge of the type species of many genera. This deficiency is very acute in some families. In the Diaspididae, however, considerable progress was made by Ferris (1936–41) who illustrated most of those known at that time but some important type species were not available to him and hence some of the genera are still unknown.

With the ever increasing number of species and genera being described, it seems essential that the little-known type species of genera should be redescribed when available and some of the gaps are filled by the present paper. The type species of some recent genera are also redescribed with the emphasis on illustrations. Obviously many more genera are still to be described and our knowledge of the group will be incomplete, probably for a considerable time. Some species have been studied which do not fit comfortably in any known genus and, as their characters are so distinctive, new genera have been erected for them.

The present work is based on a study made by the authors in London and Leningrad of types, paratypes or authentic material in the British Museum (Natural History) and in the Zoological Institute of the Academy of Sciences of the U.S.S.R.

Material available in the British Museum (Natural History) of *Aspidiotus corokiae* Maskell and *Mytilaspis intermedia* Maskell was too poor for critical study and further material has kindly been made available from the Maskell collection by Dr. W. Cottier of the Department of Scientific and Industrial Research, Nelson, New Zealand to whom the writers are much indebted.

Only adult females of *Doriopus bilobus* Brimblecombe were available but Dr. A. R.

Brimblecombe of the Department of Agriculture and Stock, Brisbane, Queensland, has kindly sent second stage females and further adults for study for which the authors are grateful.

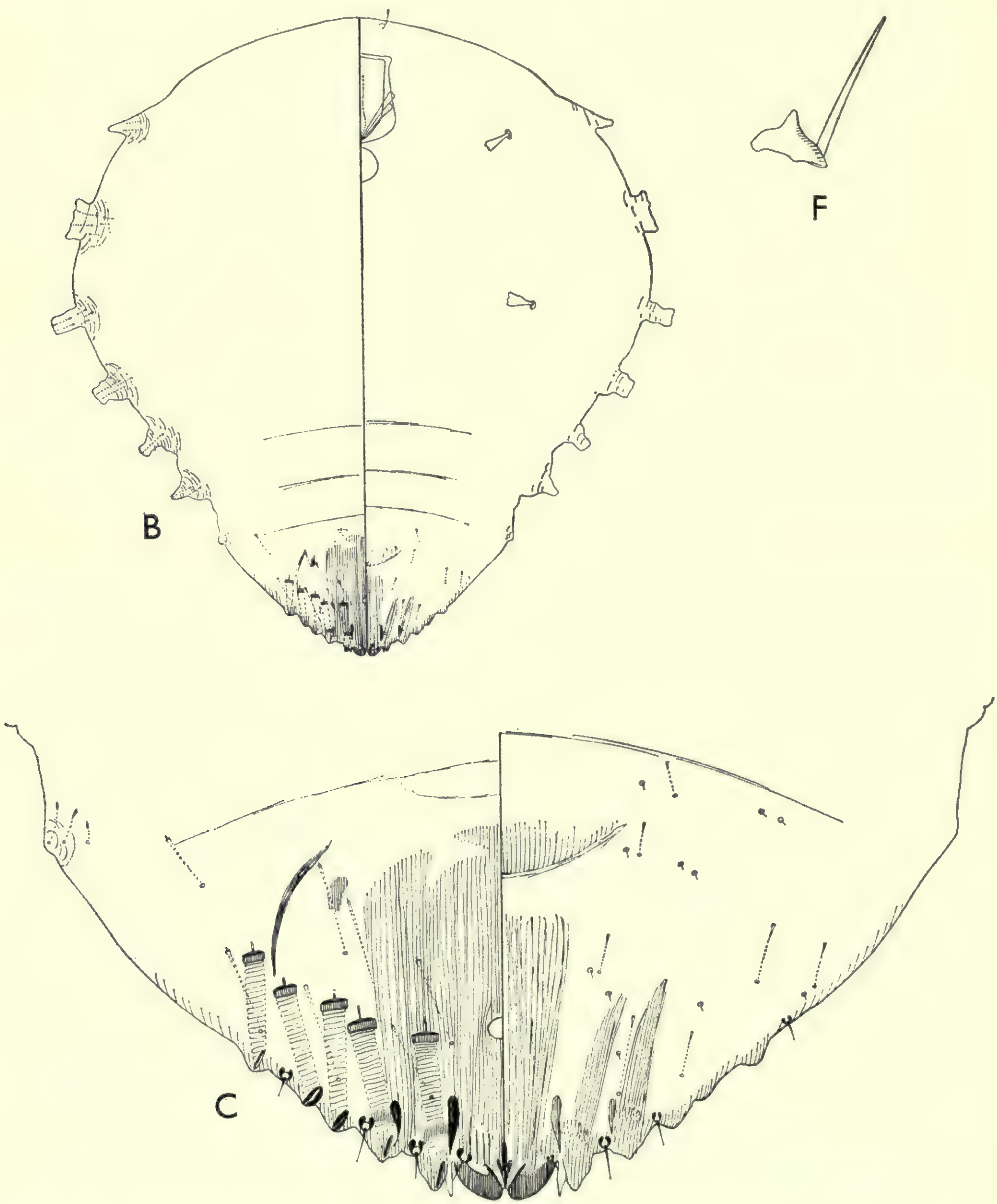

FIG. 1. *Alioides tuberculata* (Laing). Holotype in the British Museum (Nat. Hist.) London. Australia : Northern Territory, Darwin, on *Melaleuca leucadendra*, 26.vi.1917 (*G. F. Hill*).

GENERA OF THE TRIBE DIASPIDINI

ALIOIDES Brimblecombe

(Text-fig. 1)

Alioides Brimblecombe, 1958 : 91.

Type species : *Aspidiotus tuberculatus* Laing, 1929, Australia.

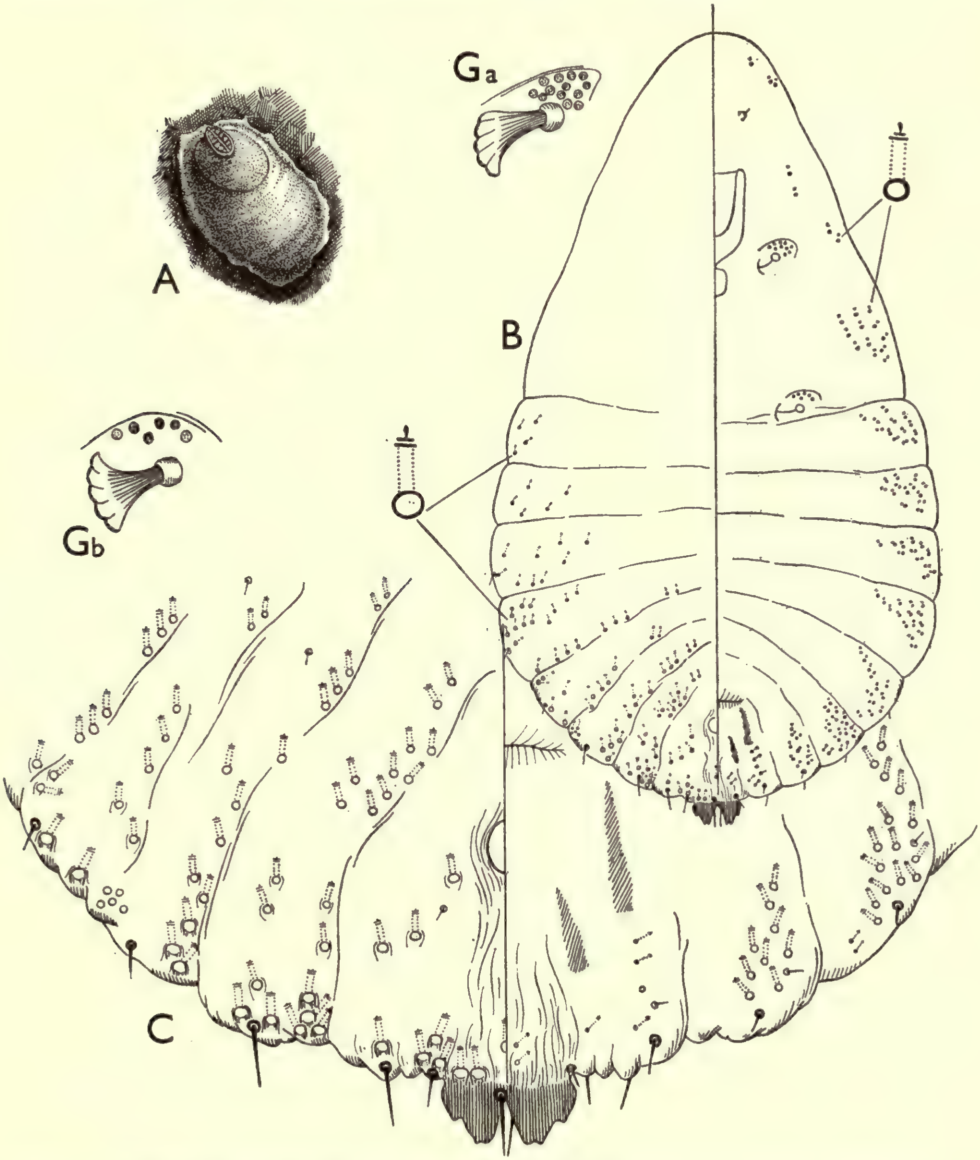

FIG. 2. *Artemisaspis artemisiae* Borchsenius. Holotype in the Zoological Institute of Academy of Sciences of the U.S.S.R., Leningrad. U.S.S.R. South Tadzhikistan, on stems of *Artemisia* sp., 15.vi.1944 (*N. S. Borchsenius*).

Although the only included species was originally described in the genus *Aspidiotus* Bouché, it was placed in the tribe Diaspidini by Brimblecombe. The peculiar combination of characters makes a positive tribal placing very difficult. Although the marginal tubercle-like processes on the thorax and prepygidial segments permit easy recognition, the most interesting characters are to be found on the pygidium. The inner end of each marginal duct is heavily sclerotized and it is difficult to deter-

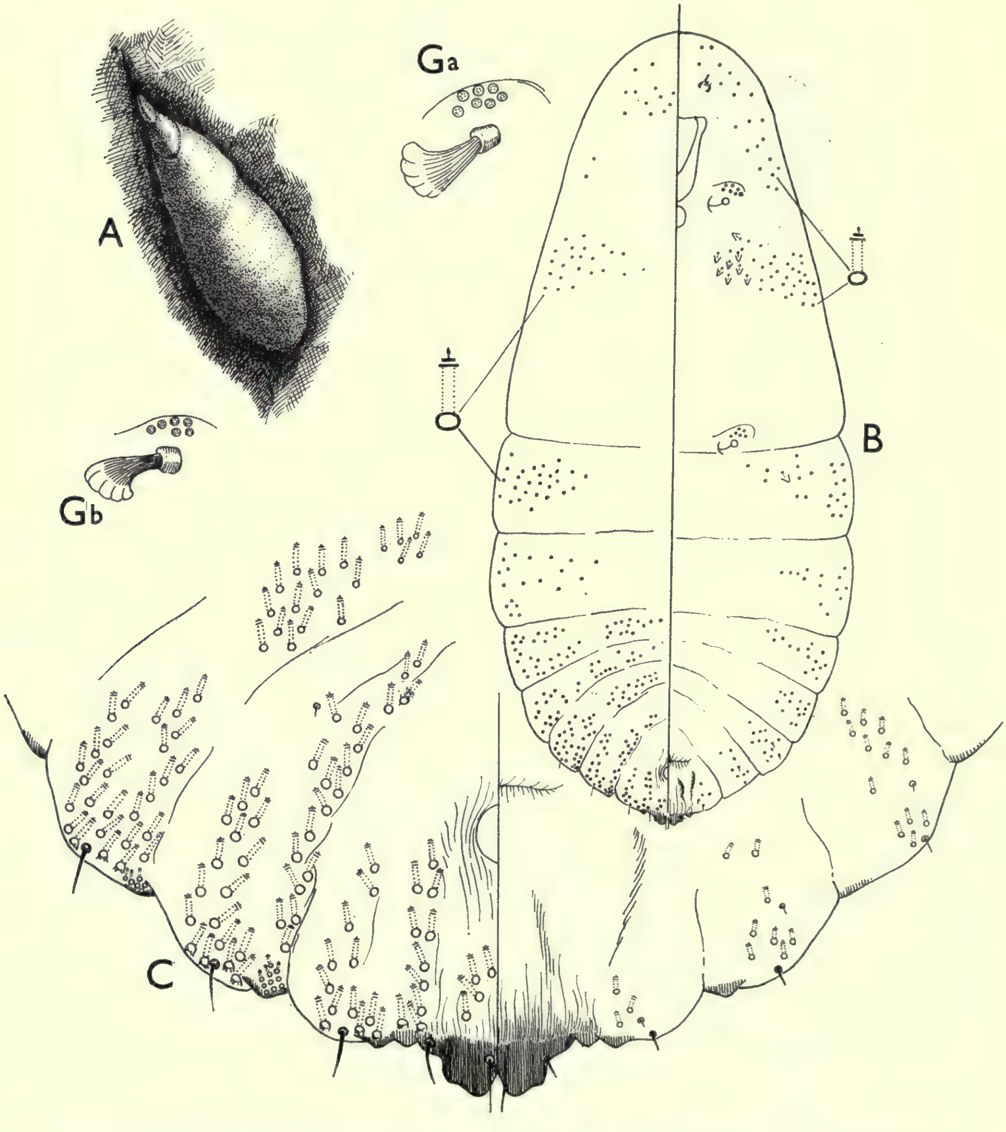

FIG. 3. *Artemisaspis farsetiae* (Hall), type of the genus *Eremohallaspis* Bodenheimer. Holotype in the British Museum (Nat. Hist.) London. Egypt : Masara, on stems of *Farsetia aegyptiaca*, 6.iv.1928 (*W. J. Hall*).

mine whether there are actually one or two bars. Each duct has its opening on a lobe-like structure which, although sclerotized, resembles the lobe-like structures which are often well developed between the lobes of *Diaspis* and related genera. They are not gland spines as noted by Brimblecombe. The paraphyses are typical of many in the Aspidiotini. As the second stage female is almost a replica of the adult female it has not been possible to come to any further conclusions and the genus is left in the Diaspidini.

ARTEMISASPIS Borchsenius

(Text-figs. 2, 3)

Artemisaspis Borchsenius, 1949 : 736.
Artemisaspis Borchsenius ; Borchsenius, 1950 : 202.
Eremohallaspis Bodenheimer, 1951 : 330.
Artemisaspis Borchsenius ; Balachowsky, 1953 : 29.
Eremohallaspis Bodenheimer ; Balachowsky, 1954 : 157.

Type species : *Artemisaspis artemisiae* Borchsenius, 1949, Tadzhikistan.

The genus *Artemisaspis* Borchsenius contains two species *A. artemisiae* Borchsenius and *A. farsetiae* (Hall) distributed in Central Asia and North Africa. In the arrangement of the dorsal ducts and the absence of marginal macroducts, the genus comes closest to *Contigaspis* MacGillivray but differs in the much longer pair of median lobes which have the bases contiguous.

Bodenheimer (1951) described the genus *Eremohallaspis* (Text-fig. 3) with *Coccomytilus farsetiae* Hall (1926) as type. This species is very close to *A. artemisiae* differing in the greater number of dorsal ducts on the abdomen and the presence of dorsal ducts on the cephalothorax. These differences together with others in the scale, the shape of the body and the slight differences in the median lobes, do not warrant the recognition of another genus. The name *Eremohallaspis*, therefore, is synonymized with *Artemisaspis*.

Balachowsky (1953) has suggested that the genus *Artemisaspis* is identical with *Rhizaspidiotus* MacGillivray but they are quite distinct and even belong to different tribes. A new name *Rhizaspidiotus mesasiaticus* suggested by Balachowsky (1953) in place of *Artemisaspis artemisiae* Borchsenius (**syn. n.**) was not necessary and hence is a synonym of the latter.

CHLIDASPIS Borchsenius

(Text-fig. 4)

Chlidaspis Borchsenius, 1949 : 736.
Chlidaspis Borchsenius ; Borchsenius, 1950 : 202.
Tecaspis Hall ; Balachowsky, 1954 : 369. [*Ex parte.*]

Type species : *Phenacaspis prunorum* Borchsenius, 1939, Armenia.

The genus *Chlidaspis* Borchsenius, represented by a single species known from Central Asia and the Near East, belongs to the group comprising the genera *Tecaspis* Hall (1946*a*), *Voraspis* Hall (1946*a*) and *Rolaspis* Hall (1946*a*). It differs from these

genera in that the median lobes form a deep notch at the apex of the pygidium and the inner distal edges are distinctly divergent. Furthermore in *Chlidaspis* the ventral surface lacks the small paraphyses at the bases of the lobes which are, apparently, always present in the other genera.

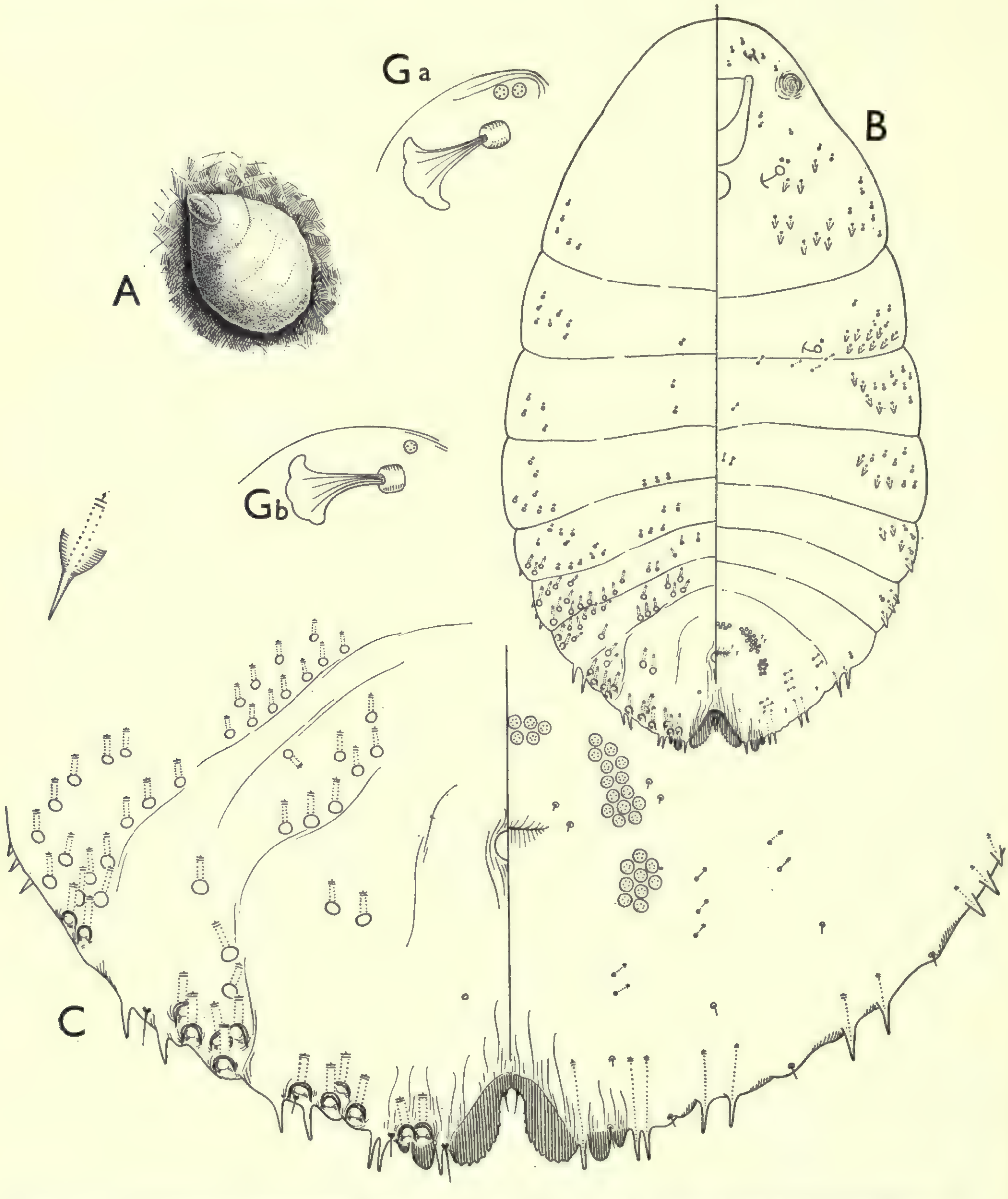

FIG. 4. *Chlidaspis prunorum* (Borchsenius). Holotype in the Zoological Institute of Academy of Sciences of the U.S.S.R., Leningrad. U.S.S.R.: Armenia, on branches and leaves of *Prunus domestica*, 5.ix.1932.

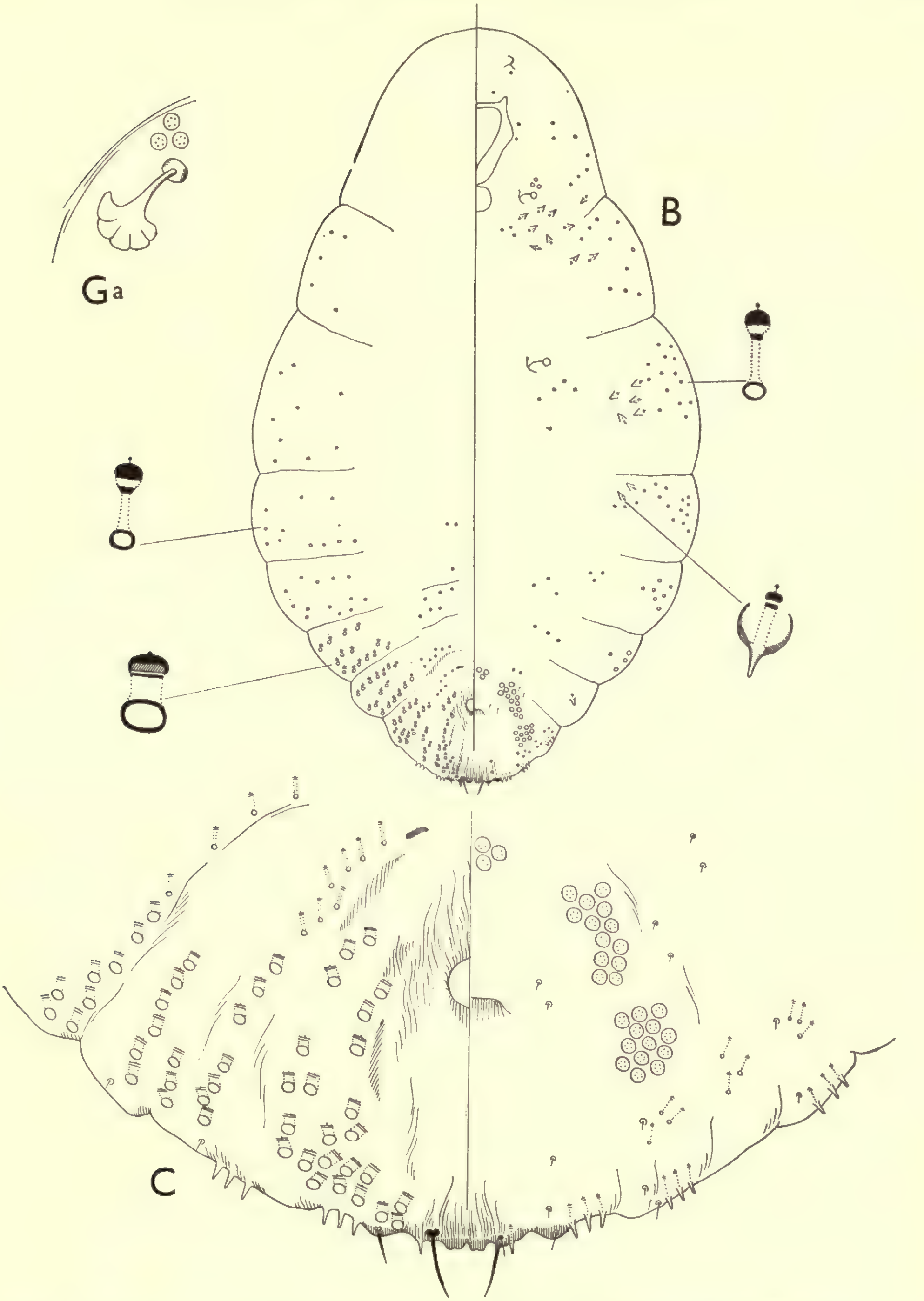

FIG. 5. *Contigaspis subnudata* (Newstead). Type in the British Museum (Nat. Hist.), London. South West Africa : Great Namaland, Brukkarossberg, (*L. Schultze*).

Balachowsky (1954) has synonymized the name *Chlidaspis* with *Tecaspis* Hall but the differences given above justify the separation of the two genera.

The species *Voraspis adlei* described by Balachowsky & Kaussari (1955) from Iran is identical with *Chlidaspis prunorum* (**syn. n.**) and the former name is here sunk as a synonym.

CONTIGASPIS MacGillivray

(Text-figs. 5, 6)

Contigaspis MacGillivray, 1921 : 309.
Contigaspis MacGillivray ; Ferris, 1936 : 21.
Contigaspis MacGillivray ; Lindinger, 1937 : 182.
Contigaspis MacGillivray ; Hall, 1946*a* : 509.
Contigaspis MacGillivray ; Borchsenius; 1950 : 204.
Eremaspis Bodenheimer, 1951 : 330.
Contigaspis MacGillivray ; Balachowsky, 1952 : 98, 101.
Contigaspis MacGillivray ; Balachowsky, 1954 : 410.
Contigaspis MacGillivray ; Ferris, 1955 : 42.
Contigaspis MacGillivray ; Kaussari, 1959 : 132.

Type species : *Chionaspis subnudata* Newstead, 1912, South West Africa.

The genus *Contigaspis* is a good one with eight or nine species widely distributed in Africa, the Near East and South and Central Asia. It belongs to the group of genera consisting of *Sclopetaspis* MacGillivray (1921), *Unachionaspis* MacGillivray (1921), *Balaspis* Hall (1946*a*), *Neochionaspis* Borchsenius (1947), *Artemisaspis* Borchsenius (1949) and *Aloaspis* Williams (1955), the adult females of which have a rounded pygidium and no typical marginal macroducts. The genus *Contigaspis* differs from these genera in possessing poorly developed median lobes which have the bases, at least, contiguous and very often resemble the lobes of *Pinnaspis* Cockerell.

Bodenheimer (1951) described the genus *Eremaspis* with *Pinnaspis zillae* Hall, 1925 as type species. This species (Text-fig. 6), however, is congeneric with the type of *Contigaspis* of which the name *Eremaspis* is regarded as a synonym.

COOLEYASPIS MacGillivray

(Text-fig. 7)

Cooleyaspis MacGillivray, 1921 : 308.
Cooleyaspis MacGillivray ; Ferris, 1936 : 21.
Cooleyaspis MacGillivray ; Hall, 1946*a* : 510.

Type species : *Chionaspis praelonga* Newstead, 1920, Uganda.

This is a distinct genus with, so far, only a single species. The distinctive features are the deeply notched median lobes, yoked at the base, and the second lobes well developed, the lobules set wide apart with the inner lobules wider and longer than the median lobes. The dorsal ducts form a submedian row on segment 6 and transverse

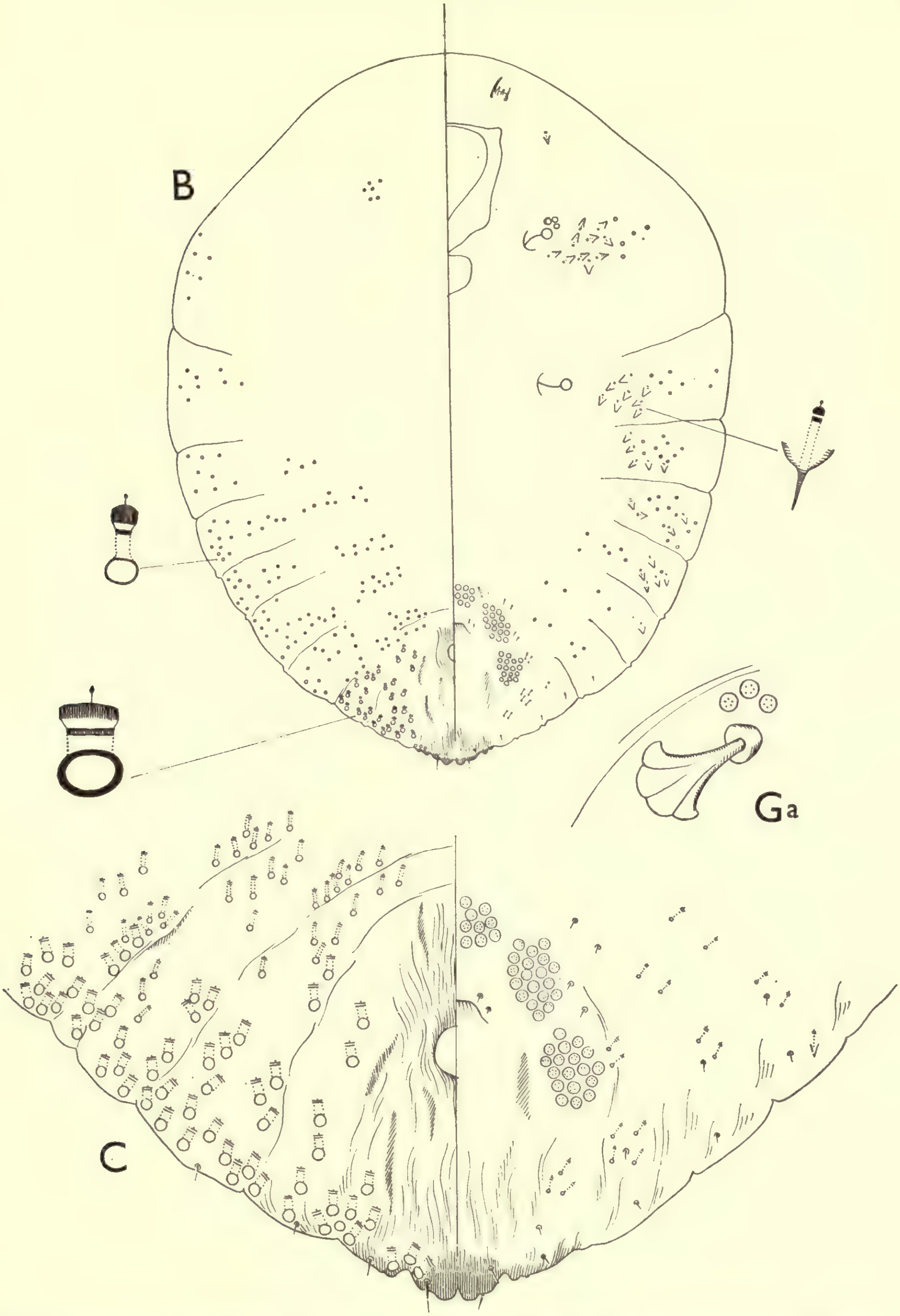

Fig. 6. *Contigaspis zillae* (Hall), type of the genus *Eremaspis* Bodenheimer. Type in the British Museum (Nat. Hist.), London. Egypt: Mokattan Hills (Desert), near Cairo, on stems of *Zilla spinosa*, 15.xi.1914.

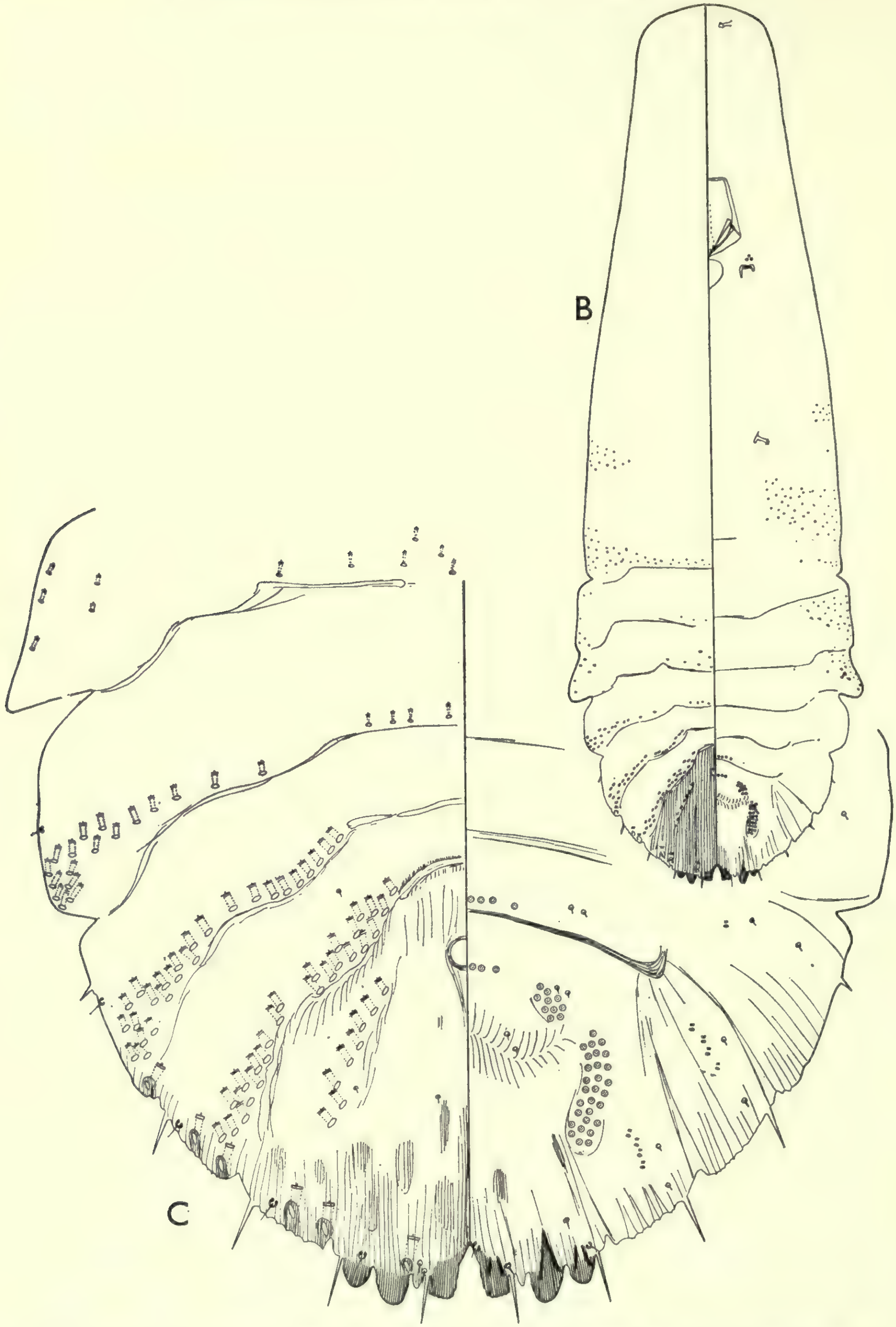

FIG. 7. *Cooleyaspis praelonga* (Newstead). Type in the British Museum (Nat. Hist.), London. Uganda: Sesse Is., Bufumira Is., on unknown tree, 12.x.1918 (*C. C. Gowdey*).

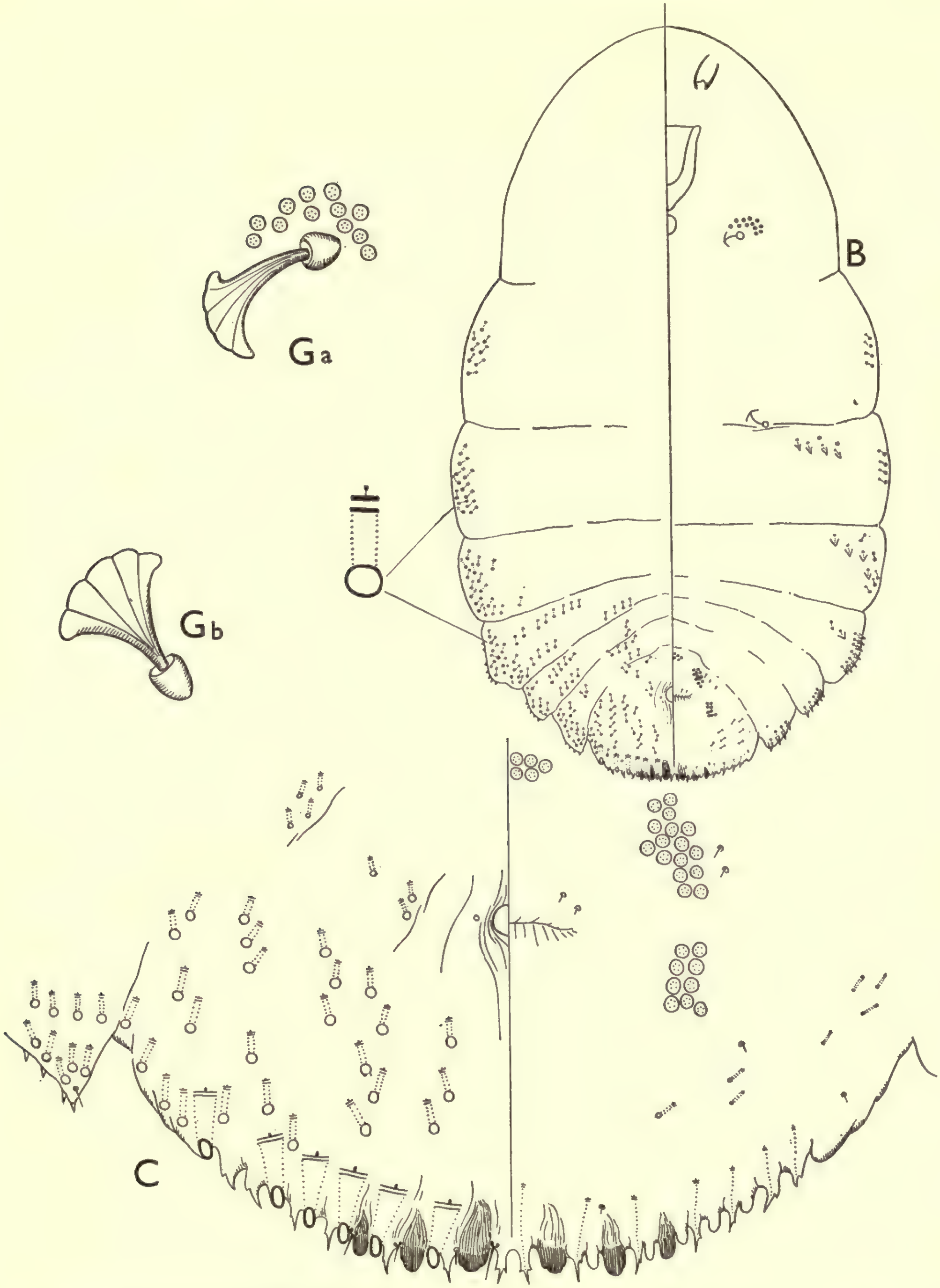

FIG. 8. *Eulepidosaphes marshali* (Laing). Holotype in the British Museum (Nat. Hist.), London. New Zealand: Wellington, Day's Bay, on *Freycinetia banksi*, 29.vii.1923 (*G. A. K. Marshall*).

rows on the anterior segments. Perivulvar pores present in three groups with a transverse median supplementary group of 7–12 pores.

This genus comes very close to the genera *Rolaspis* Hall and *Voraspis* Hall but differs from both in the median lobes forming a deep notch in the pygidium. The single supplementary group of perivulvar pores is distinctive but other supplementary groups are present in some species of *Rolaspis* and *Voraspis*. Although the marginal pygidial ducts are larger than the dorsal ducts this is also true of certain species of *Rolaspis* and it may be that some species now placed in *Rolaspis* could be transferred to *Cooleyaspis*. The types of both genera, however, are quite distinct.

EULEPIDOSAPHES gen. n.

(Text-fig. 8)

Type species : *Lepidosaphes marshali* Laing, 1925, New Zealand.

Body of adult female elongate oval. Pygidium broadly rounded, flattened apically ; with three pairs of well developed lobes, none bilobed. Gland spines wide with one or more serrations. Marginal macroducts large, six in number on either side of the pygidium. Dorsal ducts two-barred, small and numerous ; in submarginal groups on thorax and anterior abdominal segments and in definite transverse rows on other abdominal segments. Ventral surface with microducts and small gland spines. Perivulvar pores in five groups. Anterior spiracles each with a group of pores.

Scale of adult female elongate, broad at posterior end, light brown, the two exuviae terminal.

The females of this genus differ from those of *Lepidosaphes* Shimer and allied genera in having the second and third lobes not bilobed. The gland spines are similar to those of the genus *Symeria* Green (1929) but in other respects *Eulepidosaphes* differs in the number and form of the lobes and in the very large marginal macroducts of the pygidium.

LAINGASPIS gen. n.

(Text-fig. 9)

Type species : *Poliaspis lanigera* Laing, 1929, Australia.

Body of adult female oval. Pygidium slightly pointed at apex, with one pair of broadly placed median lobes. Gland spines wide. Marginal macroducts absent. Dorsal ducts two-barred, each with a heavily sclerotized rim surrounding orifice, resembling dorsal ducts of *Parlatoria*, arranged in a wide submarginal band ; smaller ducts with orifice without sclerotized rim forming groups and short rows on the posterior part of the body. Ventral surface with microducts and groups of small gland spines. Perivulvar pores in five groups and with a supplementary row of three groups anteriorly. Anterior spiracles with a group of pores.

Scale of adult female white, pyriform, granular, with the two yellow exuviae terminal.

Male scale elongate, white, granular, uncarinated, with terminal exuviae yellow.

The females of the genus *Laingaspis* differ from others in the tribe Diaspidini by the position of the dorsal ducts and by the peculiar sclerotized rim surrounding the orifice of each pygidial duct.

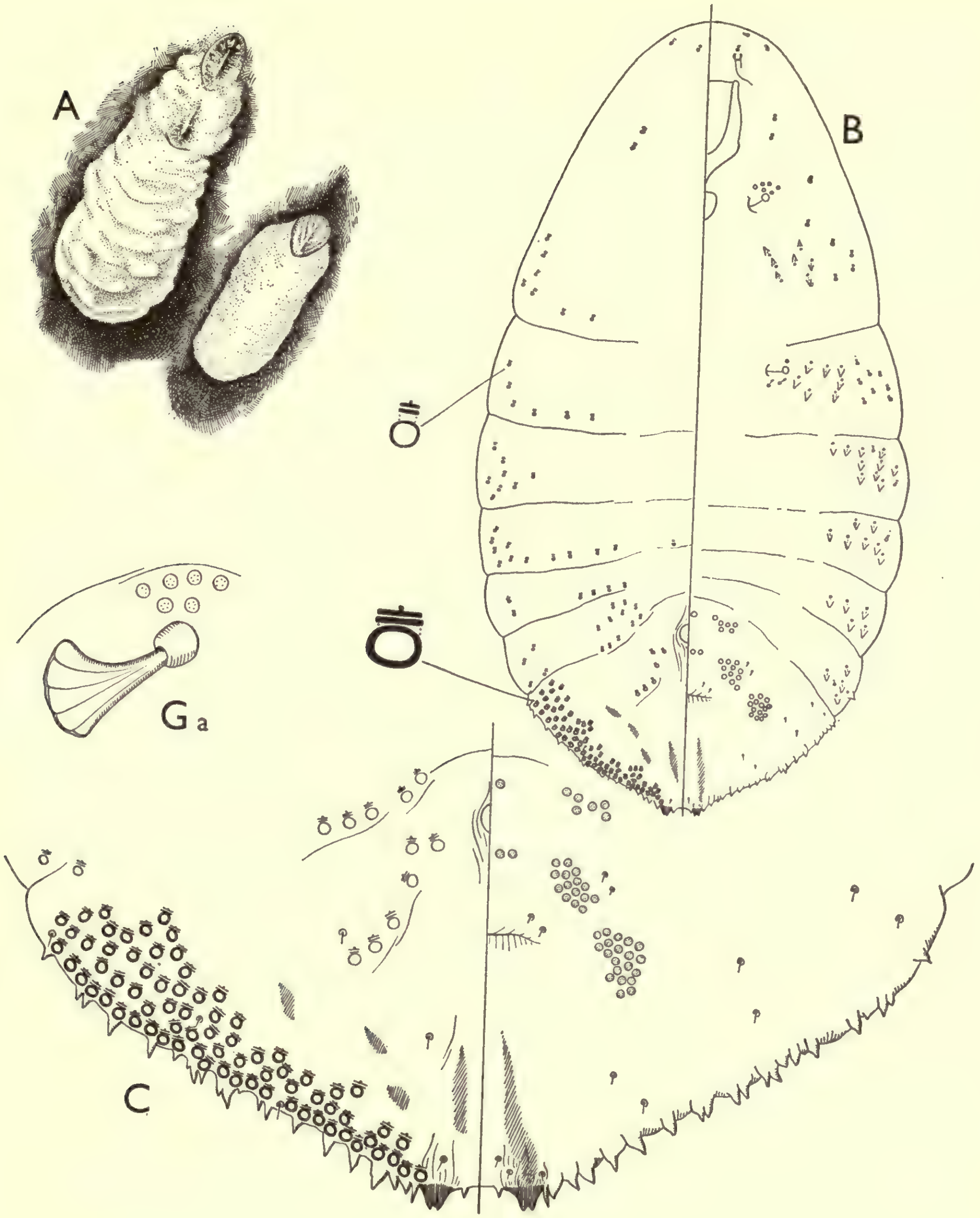

FIG. 9. *Laingaspis lanigera* (Laing). Type in the British Museum (Nat. Hist.), London. Australia : Northern Territory, Darwin, on leaves of ? mangrove.

LEONARDASPIS MacGillivray

(Text-fig. 10)

Leonardaspis MacGillivray, 1921 : 274.
Leonardaspis MacGillivray ; Ferris, 1936 : 22.

Type species : *Mytilaspis wilga* Leonardi, 1903, Australia.

This genus is distinct and will probably have other Australian species added to it. The distinctive features are the rounded pygidium, with only a single pair of median lobes, set well apart and with definite marginal macroducts. In this respect it comes close to *Berlesaspis* MacGillivray, another Australian genus, but differs in lacking vestigial legs and in possessing a supplementary row of perivulvar pores making eight groups altogether.

PROTARGIONIA Leonardi

(Text-fig. 11)

Protargionia Leonardi, 1911 : 280.
Protargionia Leonardi ; MacGillivray, 1921 : 306.
Protargionia Leonardi ; Ferris, 1936 : 21.

Type species : *Protargionia larreae* Leonardi, 1911, Argentina.

As the name suggests this genus was described as belonging to the *Aspidiotus* group but it is plainly a member of the Diaspidini as the type species possesses two-barred ducts. The genus is here regarded as distinct although there is a striking similarity to *Diaspis* Costa. It differs from *Diaspis* in lacking a macroduct between the median lobes, in the almost complete lack of gland spines except for one or two minute pairs lateral to the median and second lobes and in the absence of pores associated with the anterior spiracles.

The differences are, perhaps, small but are nevertheless distinctive. It may be that connecting forms will be discovered in South America where, as yet, the scale insect fauna is but little known.

ROLASPIS Hall

(Text-fig. 12)

Rolaspis Hall, 1946*a* : 531.
Rolaspis Hall ; Balachowsky, 1954 : 172, 357, 369.
Rolaspis Hall ; Ferris, 1955 : 42.

Type species : *Phenacaspis whitehilli* Hall, 1946, South Africa.

The genus *Rolaspis* is considered to be a good one. It consists of 16 species distributed throughout the Ethiopian Region. The females are characterized by the presence of two pairs of pygidial lobes, the median lobes being large and prominent, not divergent or with apices divergent ; not forming a deep notch in the pygidium but with their bases yoked together. Second lobes large, bilobed, slightly shorter than

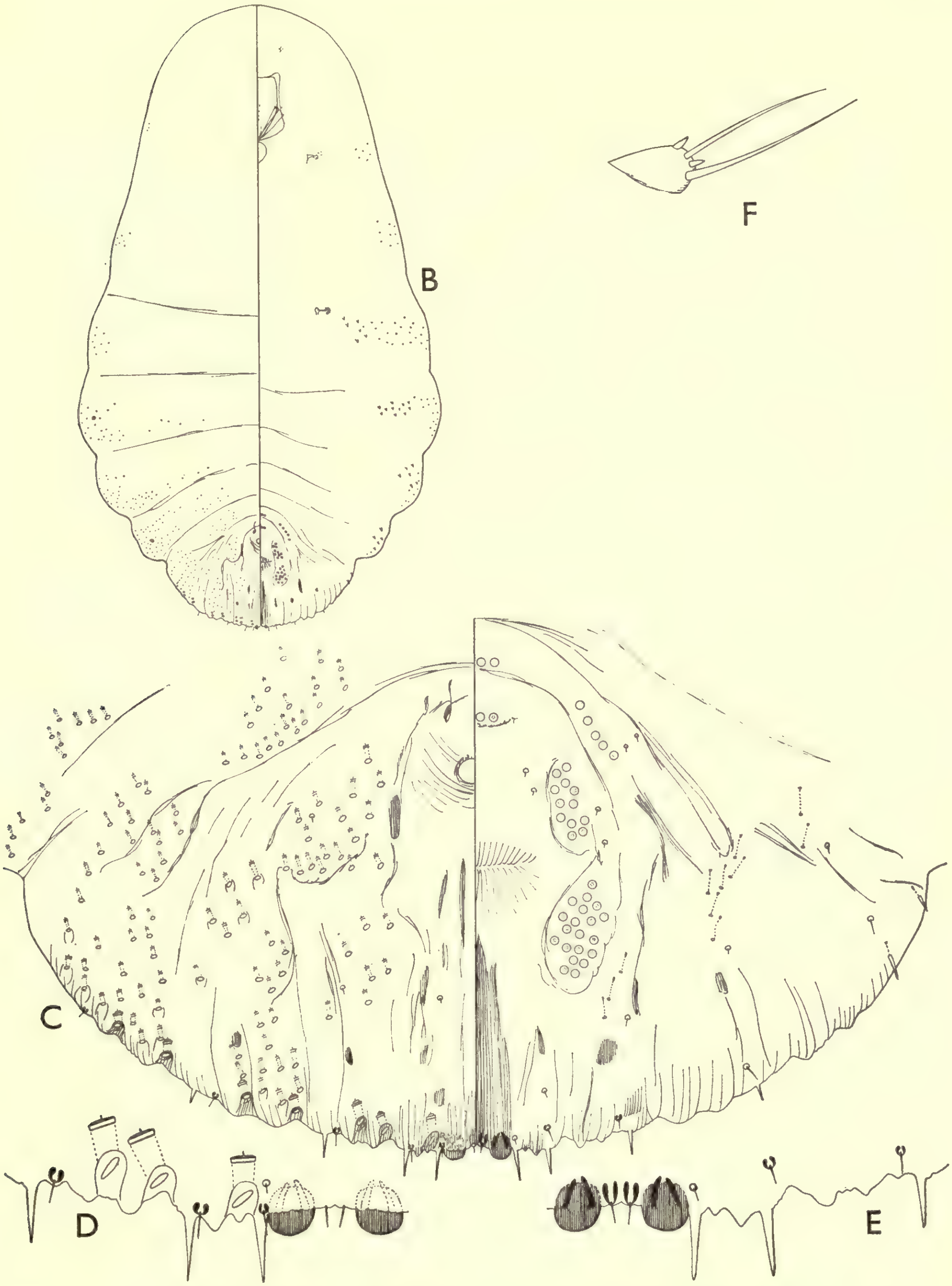

FIG. 10. *Leonardaspis wilga* (Leonardi). Type material in the British Museum (Nat. Hist.), London. Australia: New South Wales, Condobolin, on "Wilga", *Geijera parviflora*, 17.x.1900 (*W. W. Froggatt*) (No. 339).

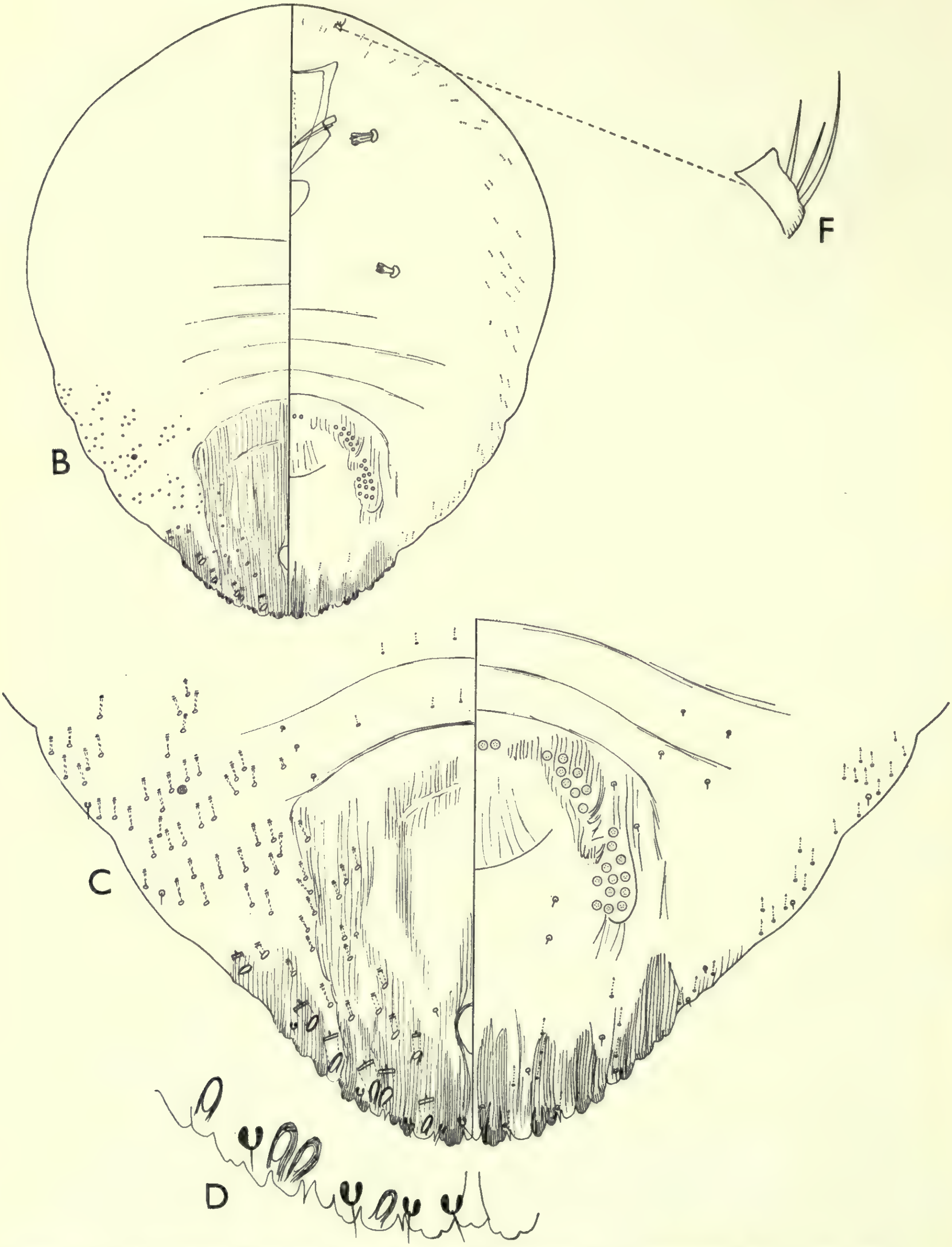

FIG. 11. *Protargionia larreae* Leonardi. Type material in the British Museum (Nat. Hist.), London. Argentina: Cacheuta, on *Larrea divaricata*, 1911.

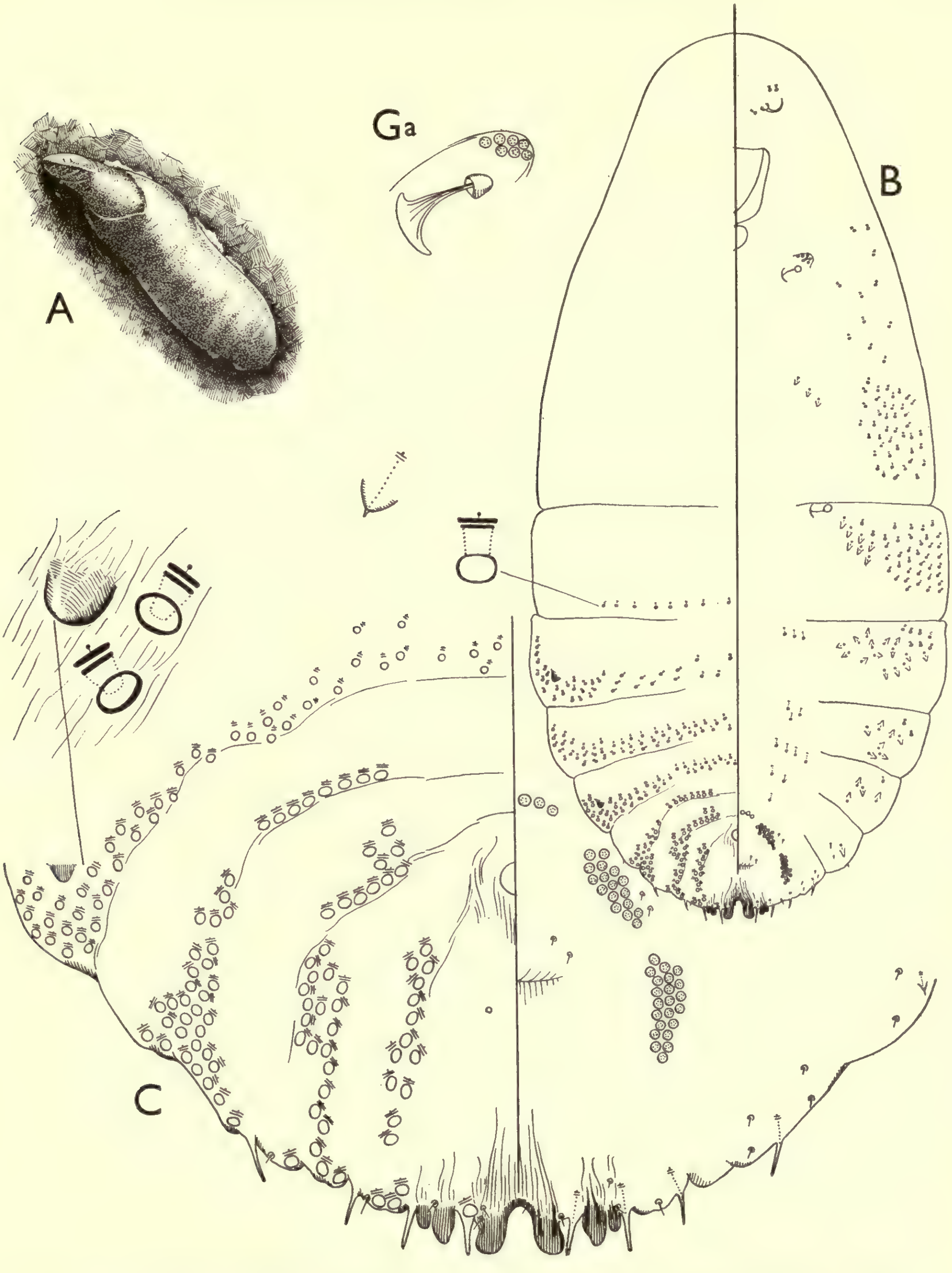

FIG. 12. *Rolaspis whitehilli* (Hall). Type in the British Museum (Nat. Hist.), London. South Africa: Cape Province, Whitehill, on *Euphorbia* sp., 26.ii.1931 (*T. D. A. Cockerell*).

the median lobes, the lobules very close together. Dorsal ducts on at least some of the prepygidial segments forming complete rows.

This genus differs from *Tecaspis* Hall in having well developed second lobes but the remarks under the genus *Cooleyaspis* should be considered.

SCRUPULASPIS MacGillivray

(Text-fig. 13)

Scrupulaspis MacGillivray, 1921 : 274.
Scrupulaspis MacGillivray ; Ferris, 1936 : 23.

Type species : *Mytilaspis intermedia* Maskell, 1891, New Zealand.

This is a distinct genus belonging to the *Lepidosaphes* group. The adult females are characterized by the pair of large median lobes with their axes set at an angle and set apart by a space about half the width of one lobe, the space occupied by a pair of short gland spines. Second and third lobes not bilobed, represented at most by sclerotized points but with the ventral surface of each lobe with prominent paraphyses. Marginal macroducts six on either side of pygidium with a submarginal macroduct on the seventh segment. Dorsal ducts small and numerous, arranged in submarginal and submedian groups. Gland spines very small, the most noticeable features being the presence of four between the second and third lobes. Perivulvar pores in five groups.

The genus *Scrupulaspis* comes closest to *Lepidosaphes* Shimer but differs in having the axes of the median lobes set at an angle, in possessing second and third lobes which are mere sclerotized points and in having very short gland spines.

VORASPIS Hall

(Text-fig. 14)

Voraspis Hall, 1946*a* : 539.
Voraspis Hall ; Balachowsky, 1954 : 356.
Voraspis Hall ; Ferris, 1955 : 42.

Type species *Chionaspis carpenteri* Laing, 1929, Uganda.

The genus *Voraspis* is a good one and consists of six species from various parts of Africa. The distinguishing features of the genus are the short median lobes only slightly notched into the apex of the pygidium. The lateral lobes are longer and bilobed, the lobules set wide apart. As mentioned by Hall (1946*a*) the dorsal ducts are separated into submarginal and submedian groups and on some of the prepygidial segments there are supplementary pores parallel to the submedian pores. The distribution of the dorsal ducts is one of the most important characters separating this genus from *Rolaspis*.

XIPHURASPIS gen. n.

(Text-fig. 15)

Type species : *Chionaspis spiculata* Green, 1919, India.

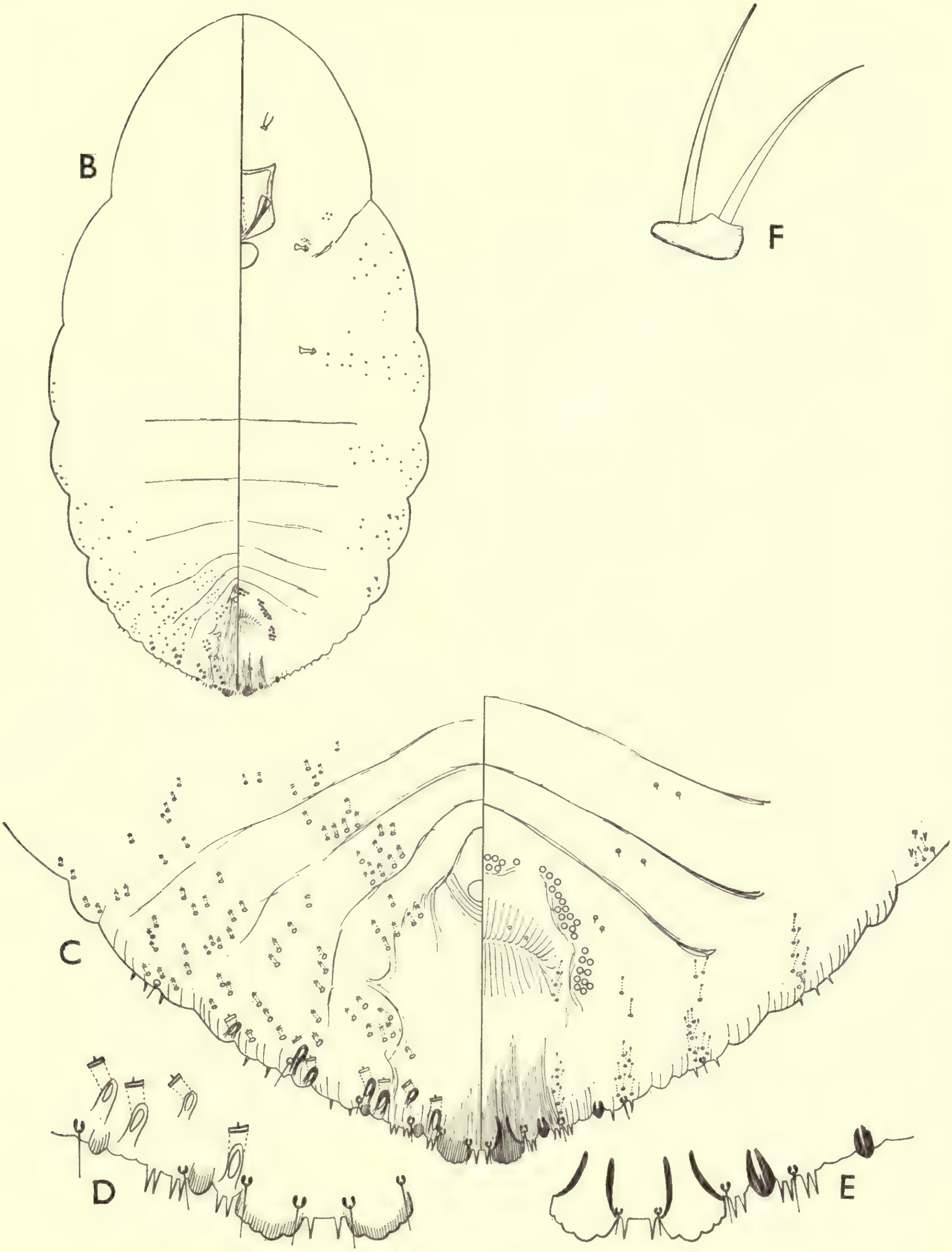

FIG. 13. *Scrupulaspis intermedia* (Maskell). Type material in New Zealand, D.S.I.R., Nelson, and type material in the British Museum (Nat. Hist.), London. New Zealand: Reefton, on *Leptospermum scoparium*.

Body of adult female narrow and long. Pygidium pointed, without lobes. Pygidial gland spines sharply pointed, seta-like. Small gland spines and ducts present on the metathorax and first abdominal segment. Dorsal ducts two-barred, numerous over almost entire surface of pygidium and forming submarginal groups and transverse rows on the first few prepygidial segments. Marginal macroducts absent. Perivulvar pores in five groups. Anterior spiracles each with a group of pores.

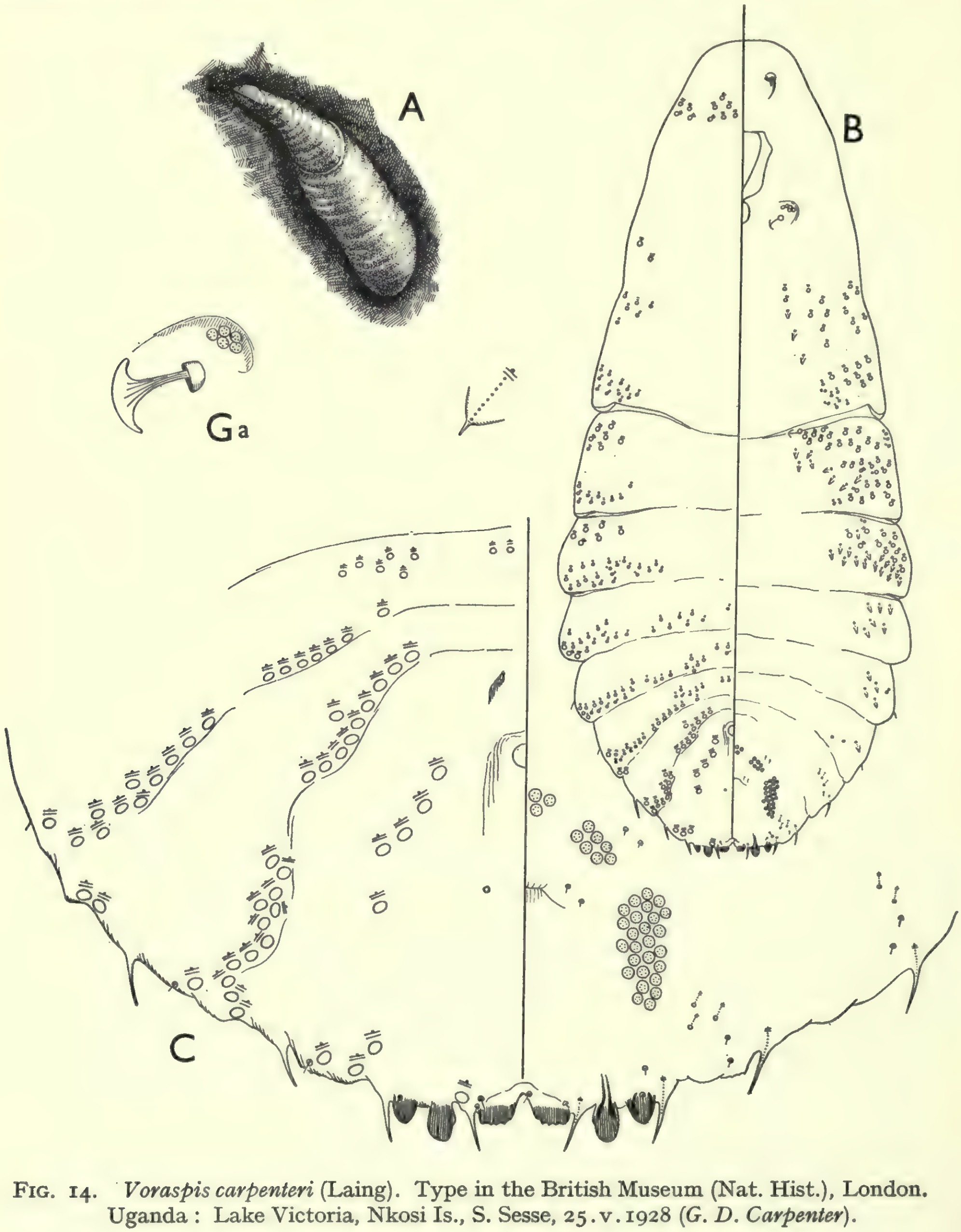

FIG. 14. *Voraspis carpenteri* (Laing). Type in the British Museum (Nat. Hist.), London. Uganda: Lake Victoria, Nkosi Is., S. Sesse, 25.v.1928 (*G. D. Carpenter*).

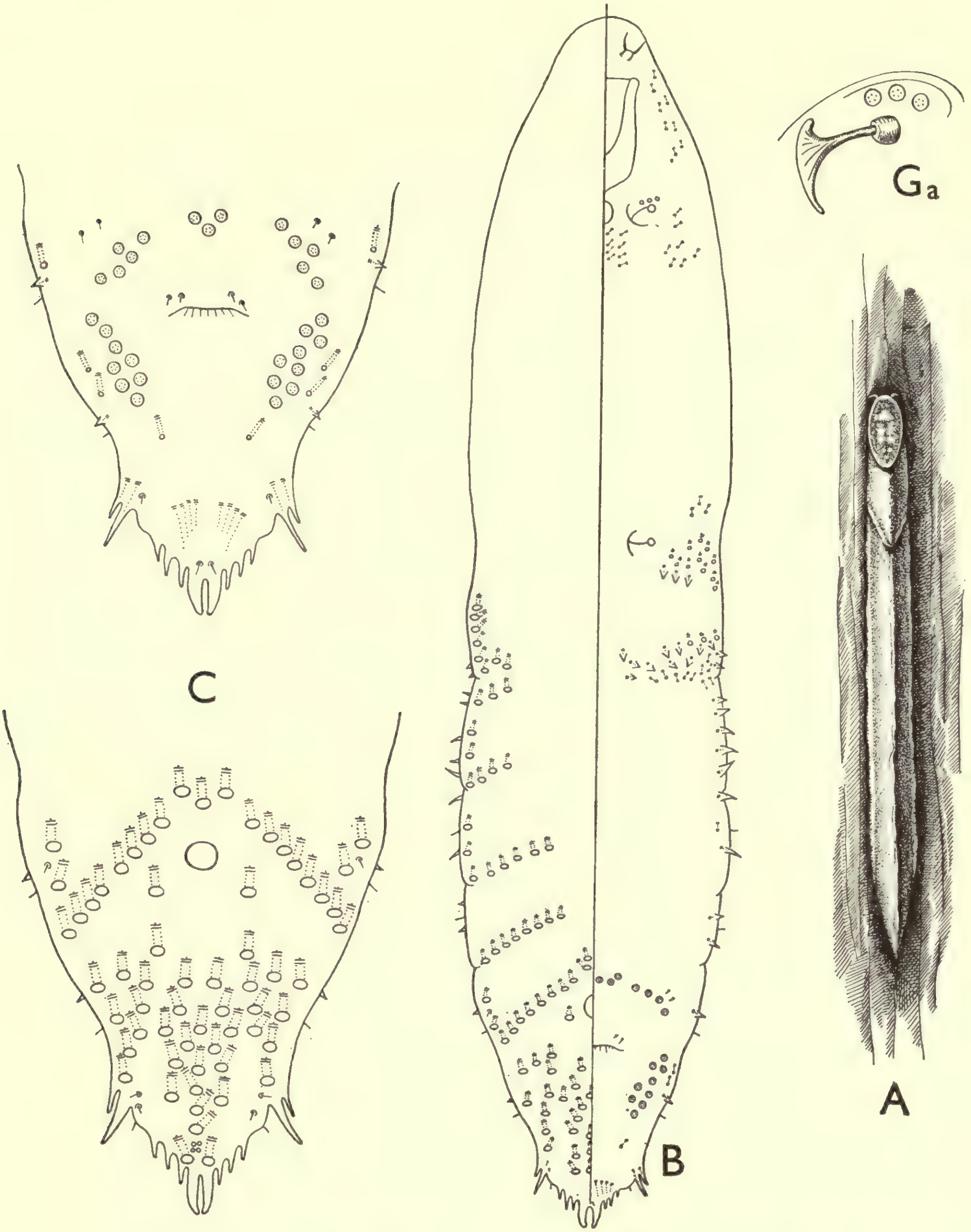

FIG. 15. *Xiphuraspis spiculata* (Green). Type in the British Museum (Nat. Hist.), London. India: Peria Ghat, N. Malabar (2,000 feet), 8.x.1917 (*T. V. Ramakrishna Ayyar*).

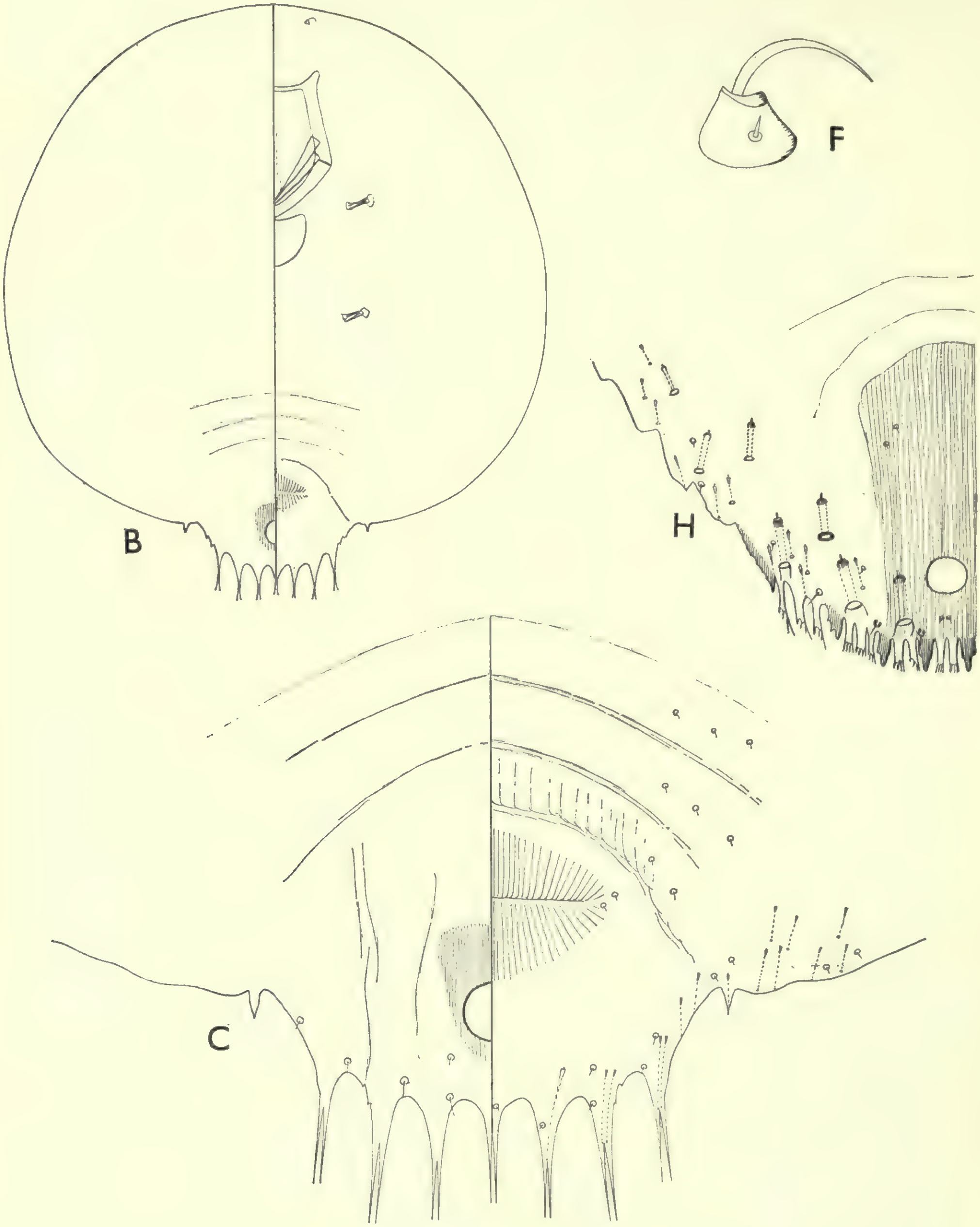

FIG. 16. *Agrophaspis buxtoni* (Laing). Holotype in the British Museum (Nat. Hist.), London. New Caledonia : Tontouta, on switch grass, vi. 1925 (*P. A. Buxton*).

Scale of adult female long and narrow, white with longitudinal median carina ; the two exuviae terminal, yellowish.

A distinctive genus and apparently allied to the genus *Kuwanaspis* MacGillivray but differing in the absence of pygidial lobes and broad serrate processes.

GENERA OF THE TRIBE PARLATORIINI

AGROPHASPIS gen. n.

(Text-fig. 16)

Type species : *Aonidia buxtoni* Laing, 1933, New Caledonia.

Adult female almost entirely membranous, subcircular. Pygidium lacking the usual characteristics of the family but with seven projections, most of which have bifid processes resembling long gland spines but occasionally with three of these processes. Most of the major projections carry one or two microducts. Other microducts situated ventrally on the prepygidial segments. Anal ring noticeably large and situated towards apex. Anterior spiracles without pores.

Second stage female broadly ovoid. Pygidium with three definite pairs of lobes and a long triangular strip in place of the fourth lobe. Fringed plates present between the lobes. Tubular ducts short with inner end sclerotized and appearing one-barred although this condition not certain. Anal ring large, lying near apex. Ventral surface with sclerotized gland tubercles on thorax.

A pupillarial form, second stage female described as " subcircular, highly convex, warm reddish brown."

This genus comes close to *Greeniella* Cockerell in possessing peculiar projections in the adult female without any sign of lobes. The second stage female differs from that of *Greeniella* in possessing three definite pairs of lobes instead of two pairs.

DORIOPUS Brimblecombe

(Text-fig. 17)

[*Doriopus* Brimblecombe, 1959 : 397. *nom. nud.*]
Doriopus Brimblecombe, 1960 : 193.

Type species : *Doriopus bilobus* Brimblecombe, 1959, Australia.

This is a good genus containing a single distinctive species. It is pupillarial and the adult female is characterized by a single pair of prominent lobes set very close together. Margin of the pygidium with an almost continuous line of gland spines which become smaller anteriorly to fourth segment where they are replaced by gland tubercles. The dorsal ducts are absent except for one or two pairs of marginal microducts. The anterior spiracles have a few pores and the second pair of spiracles are set well forward and close to the anterior pair.

It is the second stage female which shows its Parlatoriine affinities in possessing marginal pygidial macroducts with the orifices surrounded by sclerotized rims and with the axes set transversely to the margin. There are also numerous sclerotized gland tubercles on the prepygidial segments. The median lobes are similar to those in the adult female.

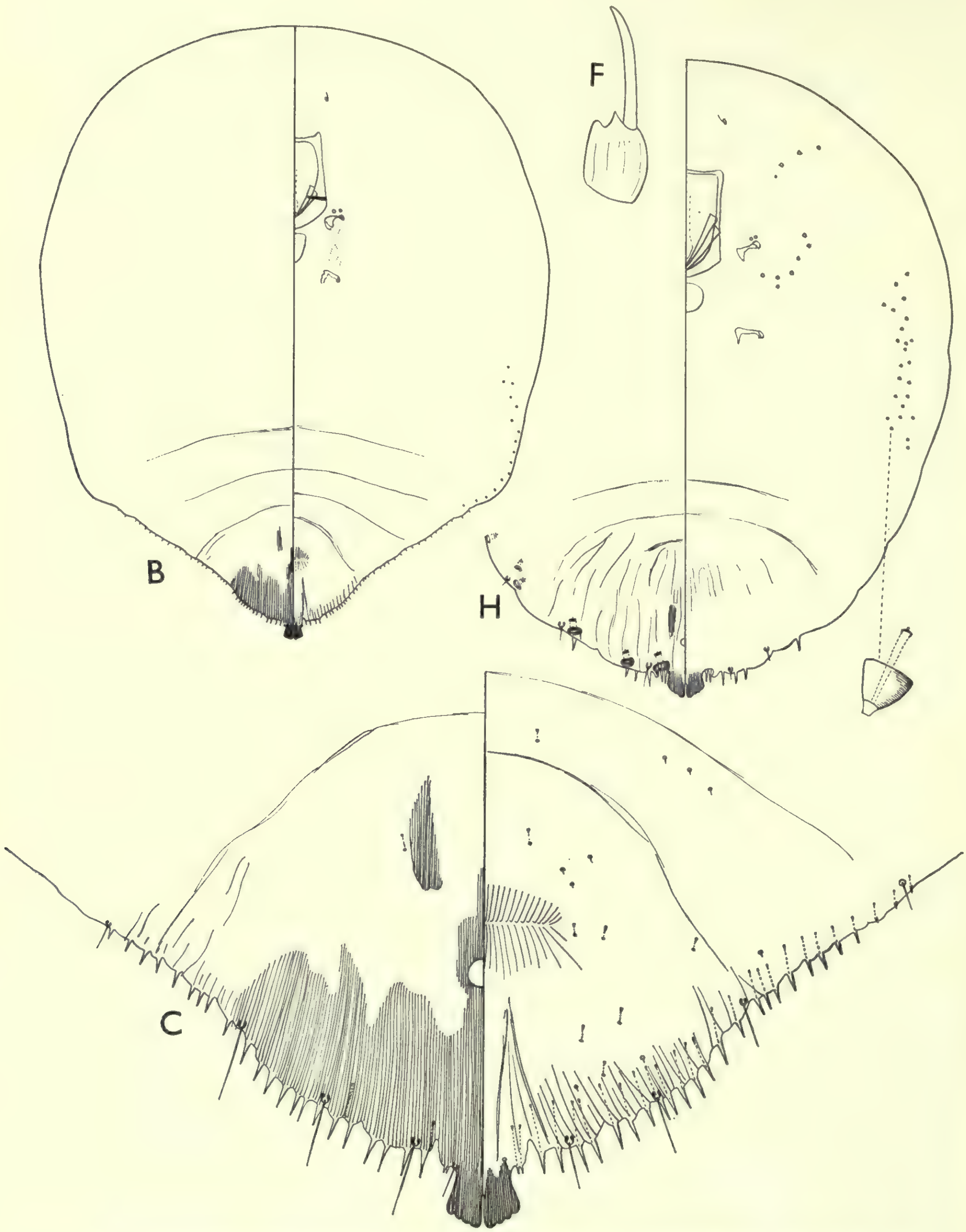

FIG. 17. *Doriopus bilobus* Brimblecombe. Paratype in the British Museum (Nat. Hist.), London. Paratype in the Department of Agriculture and Stock, Brisbane. Australia: Queensland, Gayndah, on *Acacia bidwilli*, x.1954 (*L. Pedley*).

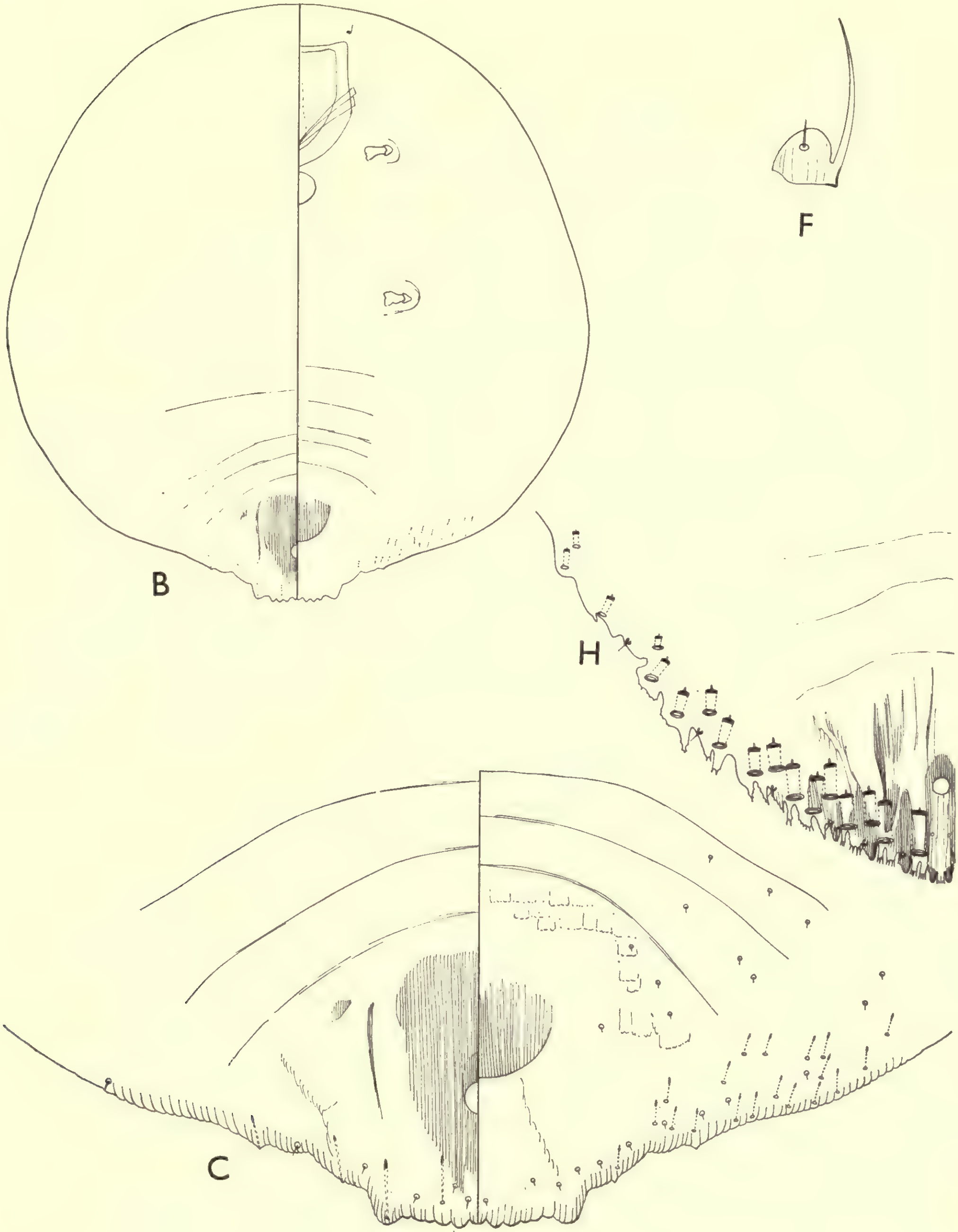

FIG. 18. *Eugreeniella pulchra* (Green). Type in the British Museum (Nat. Hist.), London. Australia: Victoria, Myrniong, on *Calistemon salignis*, (*J. Lidgett*) (No. 54).

With our incomplete knowledge of many of the pupillarial genera of the tribe Parlatoriini it is difficult to give the relationships of this genus.

EUGREENIELLA Brimblecombe

(Text-fig. 18)

Eugreeniella Brimblecombe, 1958 : 87.

Type species : *Aonidia* (*Greeniella*) *pulchra* Green, 1905*b*, Australia.

This is a distinct genus characterized by the adult female remaining within the exuviae of the second stage female. As with most pupillarial forms the adult female is membranous except for a small area on the pygidium. The distinguishing features of the genus are the short truncate pygidium devoid of any projections, the posterior edge crenulate ; dorsal ducts slender and confined to the margin.

The Parlatoriine affinities of the second stage female are shown by pygidium with four definite pairs of lobes and with fringed plates about as long as the lobes. The pygidial ducts are numerous around the margin, each with the orifice surrounded by a sclerotized rim and set with the axis transverse to the margin ; the inner end of each duct is sclerotized and most ducts show the two-barred condition but in others the second bar is difficult to determine.

This genus belongs to a group containing *Greeniella* Cockerell, *Gymnaspis* Newstead, *Porogymnaspis* Green and *Agrophaspis* gen. n. in possessing a similar type of second stage female, the nearest being *Agrophaspis*. A study of more species in these genera is needed.

LABIDASPIS gen. n.

(Text-fig. 19)

Type species : *Fiorinia myersi* Green, 1929, New Zealand.

Adult female enclosed within the exuviae of the second stage female. Shape broadly ovoid ; entire surface with a freckled appearance due to small thickenings of the derm. Pygidium without lobes or plates but the margin broadly crenulate, the crenulations at the apex projecting and sclerotized to appear as lobes. Dorsal ducts confined to a few on pygidium, small, but with orifice surrounded by a sclerotized rim. Perivulvar pores in five groups. Anterior spiracles with numerous pores. Gland tubercles present in a group opposite anterior spiracles.

Second stage female with median lobes projecting, the inner margins parallel, almost touching, the outer margins divergent. Second and third lobes represented by similar shaped projections. Plates and gland spines absent. Marginal ducts small, in the interlobular spaces ; orifices set transversely to the pygidial margin and each with sclerotized rim. Gland tubercles present around the margins.

The relationships to this genus are rather obscure but the second stage female comes nearest to that of *Doriopus* in possessing similar projecting median lobes and marginal ducts. Both genera probably belong to the same group although the adult females show some widely different characters.

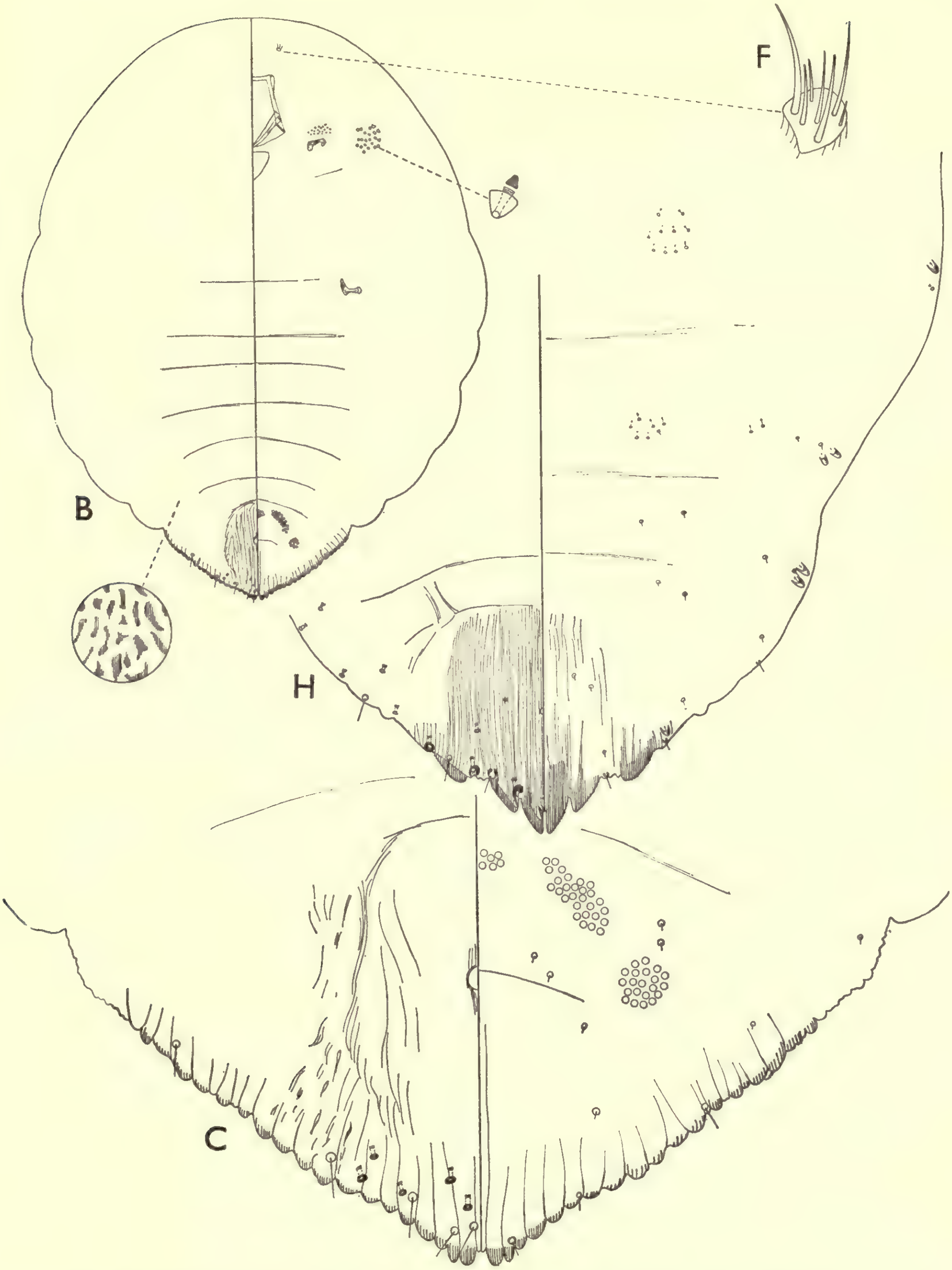

FIG. 19. *Labidaspis myersi* (Green). Type in the British Museum (Nat. Hist.), London. New Zealand: York Bay, Wellington, on *Astelia salandri*, (*J. G. Myers*).

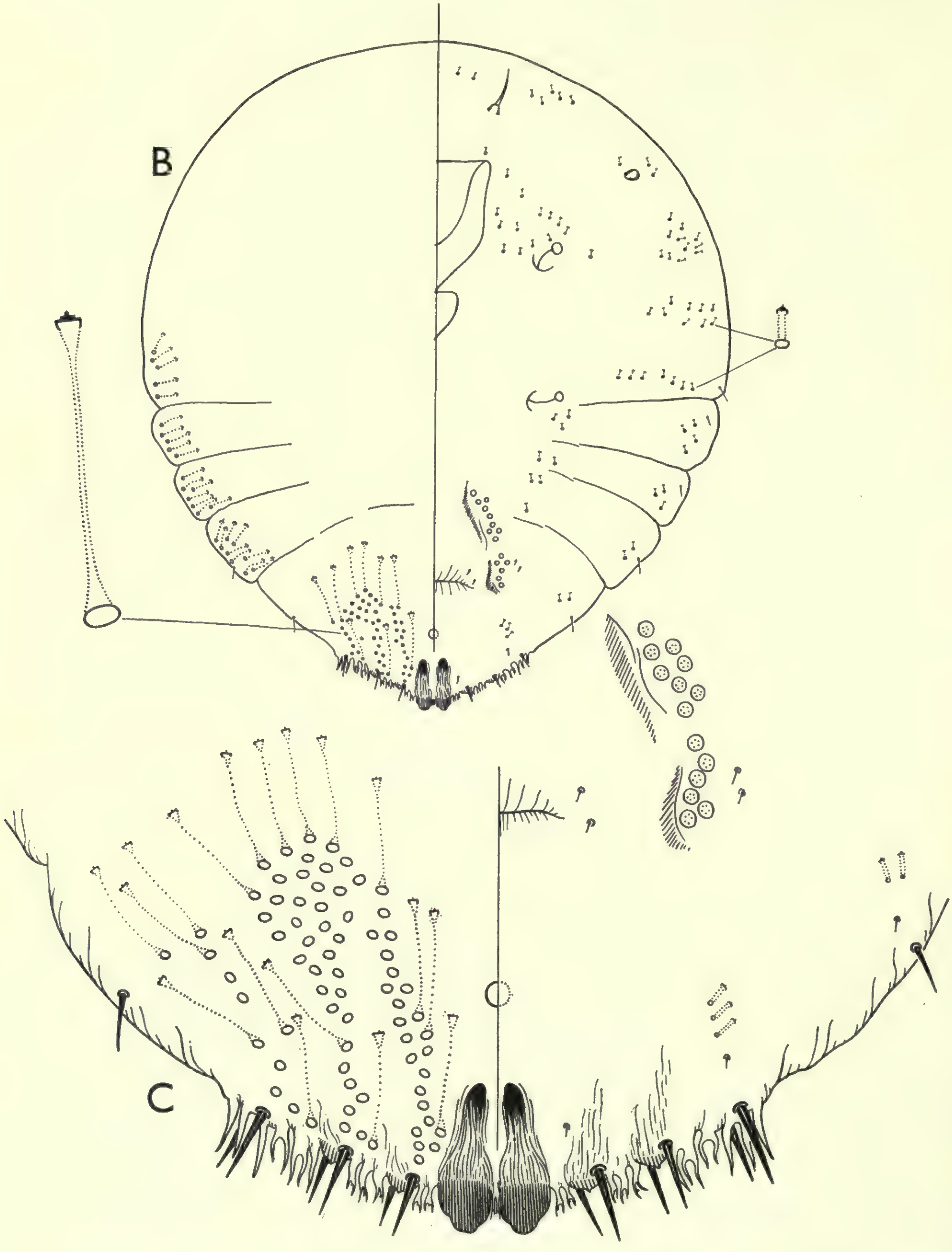

FIG. 20. *Acanthaspidiotus pustulans* (Green). Type in the British Museum (Nat. Hist.), London. Java: on the bark of *Erythrina lithosperma*, xi.1899 (*A. Zimmerman*).

GENERA OF THE TRIBE ASPIDIOTINI

ACANTHASPIDIOTUS gen. n.

(Text-fig. 20)

Type species : *Aspidiotus pustulans* Green, 1905, Java.

Body of adult female almost circular with pygidium pointed. Pygidium with three pairs of lobes ; median lobes very large, each with long basal scleroses, second and third lobes minute. Plates becoming longer anteriorly. Marginal setae very thick and spine-like. Dorsal ducts one-barred, slender and not long. Ventral surface with microducts. Perivulvar pores in four groups. Anterior and posterior spiracles without groups of pores. Paraphyses absent. Anal opening small and round, situated towards apex of pygidium.

Scale of adult female subcircular, brownish or fulvous with exuviae light brown, central.

This genus is close to the genera *Aspidiotus* Bouché and *Metaspidiotus* Takagi (1957) but differs from both in possessing slender ducts, large spine-like marginal setae and poorly developed second and third lobes. In possessing a small anal opening situated towards the apex of the pygidium the genus *Acanthaspidiotus* resembles *Monaonidiella* MacGillivray.

ANASPIDIOTUS gen. n.

(Text-fig. 21)

Type species : *Aspidiotus immaculatus* Green, 1904, Australia.

Body of adult female broadly oval. Pygidium rounded with three pairs of lobes, all well developed. Plates short, apically fringed, present only between the lobes. Dorsal ducts very large, one-barred, the inner end swollen and heavily sclerotized. Perivulvar pores and paraphyses absent. Spiracles without pores. Anal opening large and round, situated near centre of pygidium.

The large dorsal ducts with the swollen inner ends serve to distinguish the genus from *Aspidiotus* Bouché and related genera. It differs also from *Hemiberlesia* Cockerell in the position of the anal ring and the absence of paraphyses.

ARUNDASPIS Borchsenius

(Text-fig. 22)

Arundaspis Borchsenius, 1949 : 737.
Arundaspis Borchsenius ; Borchsenius, 1950 : 211.
Arundaspis Borchsenius ; Balachowsky, 1951 : 92.
Arundaspis Borchsenius ; Balachowsky, 1953 : 5.
Arundaspis Borchsenius ; Balachowsky, 1958 : 298.

Type species : *Arundaspis secreta* Borchsenius, 1949, Tadzhikistan.

The genus *Arundaspis* is considered to be a good one although it was regarded as being identical with *Rhizaspidiotus* by Balachowsky (1951). At the present time only one highly specialized species is known from Central Asia. It is allied to the genera *Aspidiella* Leonardi, *Rhizaspidiotus*, *Remotaspidiotus* MacGillivray and *Eremiaspis*

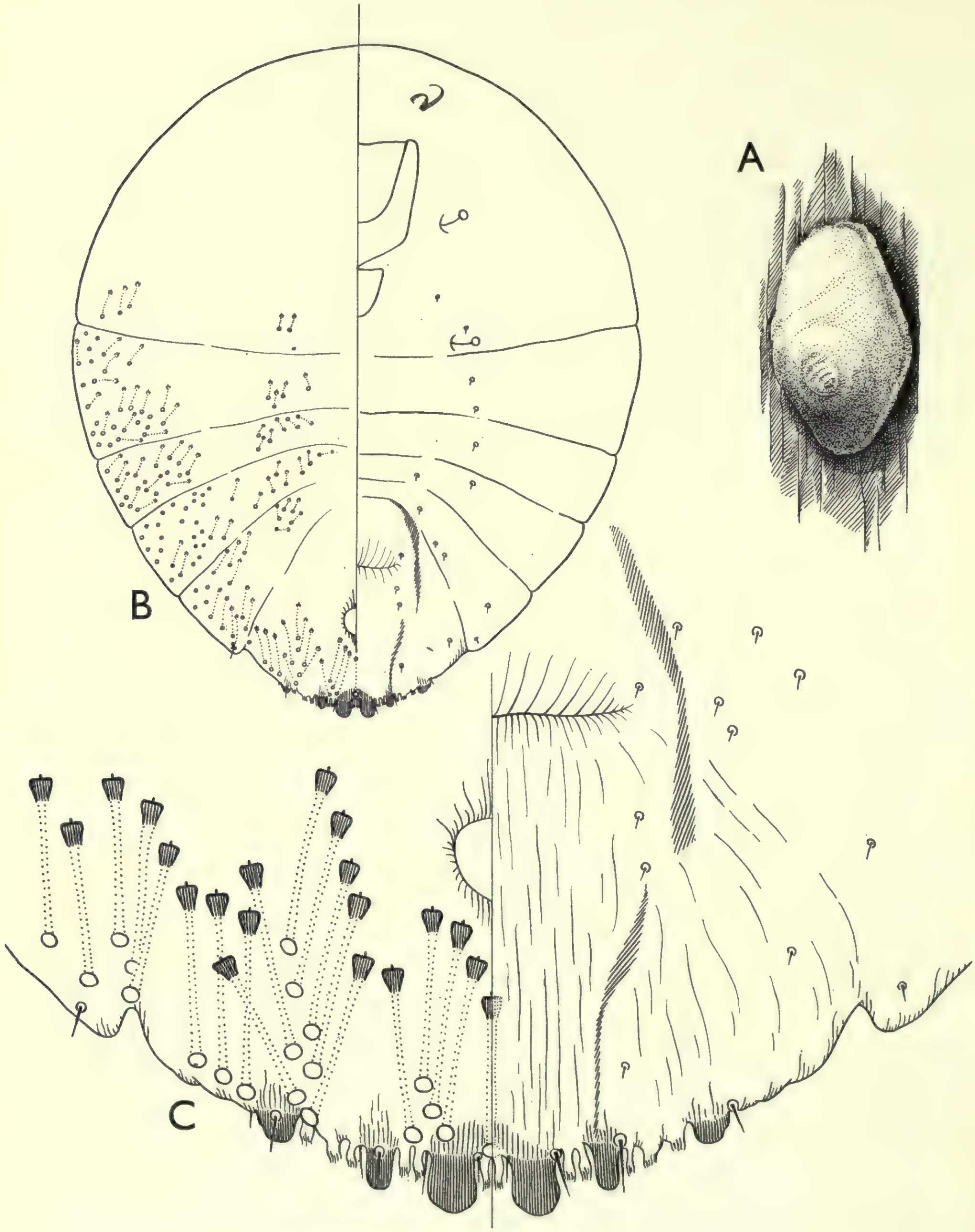

FIG. 21. *Anaspidiotus immaculatus* (Green). Type in the British Museum (Nat. Hist.), London. Australia : Victoria, Shepperton, on stems of *Styphelia virgata*, (*C. French*).

Balachowsky. All of these genera probably form one genetic branch with *Arundaspis* lying somewhat apart. The females of *Arundaspis* differ from those of the allied genera in possessing dorsal ducts with the orifices surrounded by sclerotized rims and in the median lobes being set wide apart. The median lobes of *Arundaspis*

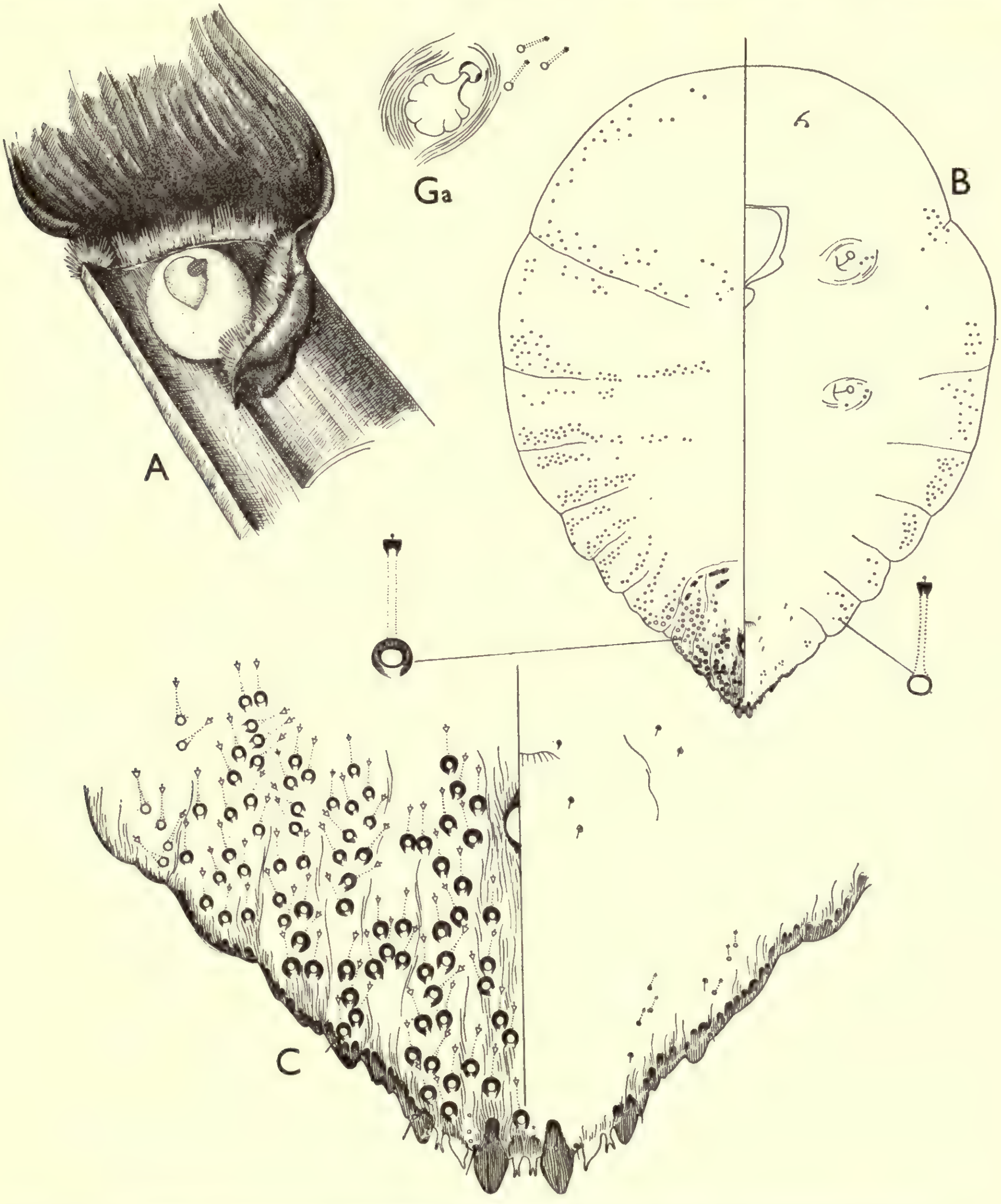

Fig. 22. *Arundaspis secreta* Borchsenius. Holotype in the Zoological Institute of Academy of Sciences of the U.S.S.R., Leningrad. U.S.S.R.: Tadzhikistan, on leaves of *Arundo donax*, 14.vi.1944 (*N. S. Borchsenius*).

and *Aspidiella* are well developed but in the other genera they are often poorly developed but if they show any signs of development then they are close together.

ASPIDIOIDES MacGillivray

(Text-fig. 23)

Aspidioides MacGillivray, 1921 : 387.
Aspidioides MacGillivray ; Ferris, 1937 : 51.

Type species : *Aspidiotus corokiae* Maskell, 1891, New Zealand.

The genus *Aspidioides* is regarded as distinct until such time as the species from New Zealand and Australia have been studied further. Its distinctive features are the three pairs of lobes, the median lobes with well developed basal scleroses ; plates fringed ; dorsal pygidial ducts small and very slender ; ventral surface with a few microducts only ; perivulvar pores represented by one or two in the anterior lateral groups only. The nearest genus is apparently *Monaonidiella* MacGillivray, also with short slender ducts but this genus lacks the second and third lobes except for non-sclerotized projections and possesses pointed plates. Although bearing a superficial resemblance to *Aspidiella* Leonardi, the genus *Aspidioides* lacks ventral pygidial ducts. The plates are similar to those in *Aspidiotus* but this genus possesses much wider lobes.

EULAINGIA Brimblecombe

(Text-fig. 24)

Eulaingia Brimblecombe, 1958 : 80.

Type species : *Pseudaonidia stenophyllae* Laing, 1929, Australia.

This is a distinct genus recently erected. With the constriction between the prothorax and mesothorax it belongs to the *Pseudaonidia-Duplaspidiotus* series. It shares with *Duplaspidiotus* MacGillivray the clavate paraphyses but differs in possessing only two pairs of lobes instead of three, the second pair being minute and very close to the median pair. Other distinguishing characters are the poorly developed plates and dorsal reticulation in the centre of the pygidium.

GOMPHASPIDIOTUS gen. n.

(Text-fig. 25)

Type species : *Aspidiotus cuculus* Green, 1905*a*, Ceylon.

Adult female broadly ovate with a small constriction between prothorax and mesothorax, body sclerotized at maturity. Pygidium tending to be pointed, with an area of faint reticulation on each of the dorsal and ventral surfaces. Margin of pygidium crenulate, heavily sclerotized but without definite paraphyses. Lobes represented by a median pair only, well developed and very close together. Plates about as long as lobes and very slender, almost seta-like but with blunt apices. Dorsal ducts numerous, very slender ; ventral ducts smaller and numerous. Anal opening minute. Anterior spiracles with a few pores.

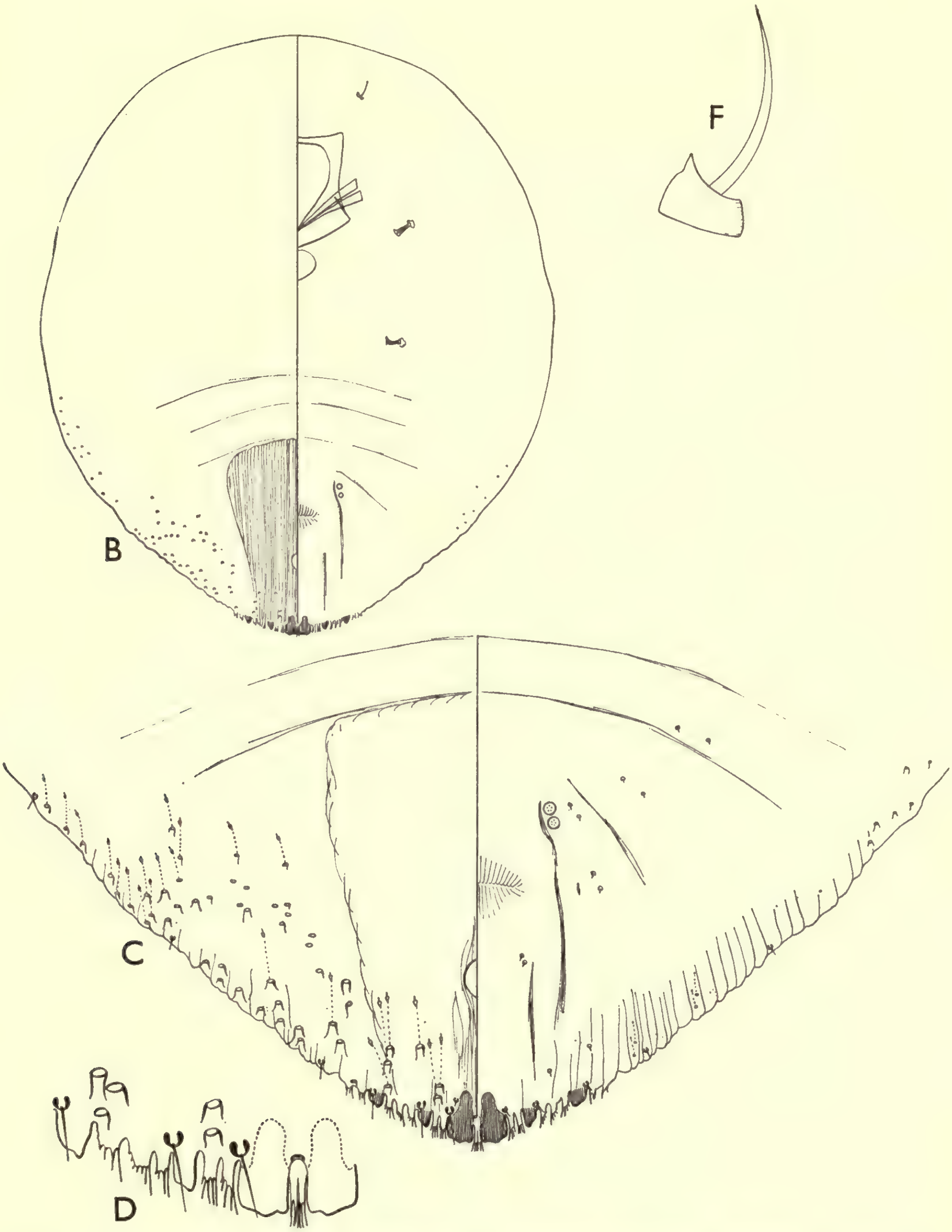

FIG. 23. *Aspidioides corokiae* (Maskell). Type material in New Zealand, D.S.I.R., Nelson and type material in the British Museum (Nat. Hist.), London. New Zealand : Reefton district, on *Corokia cotoneaster*.

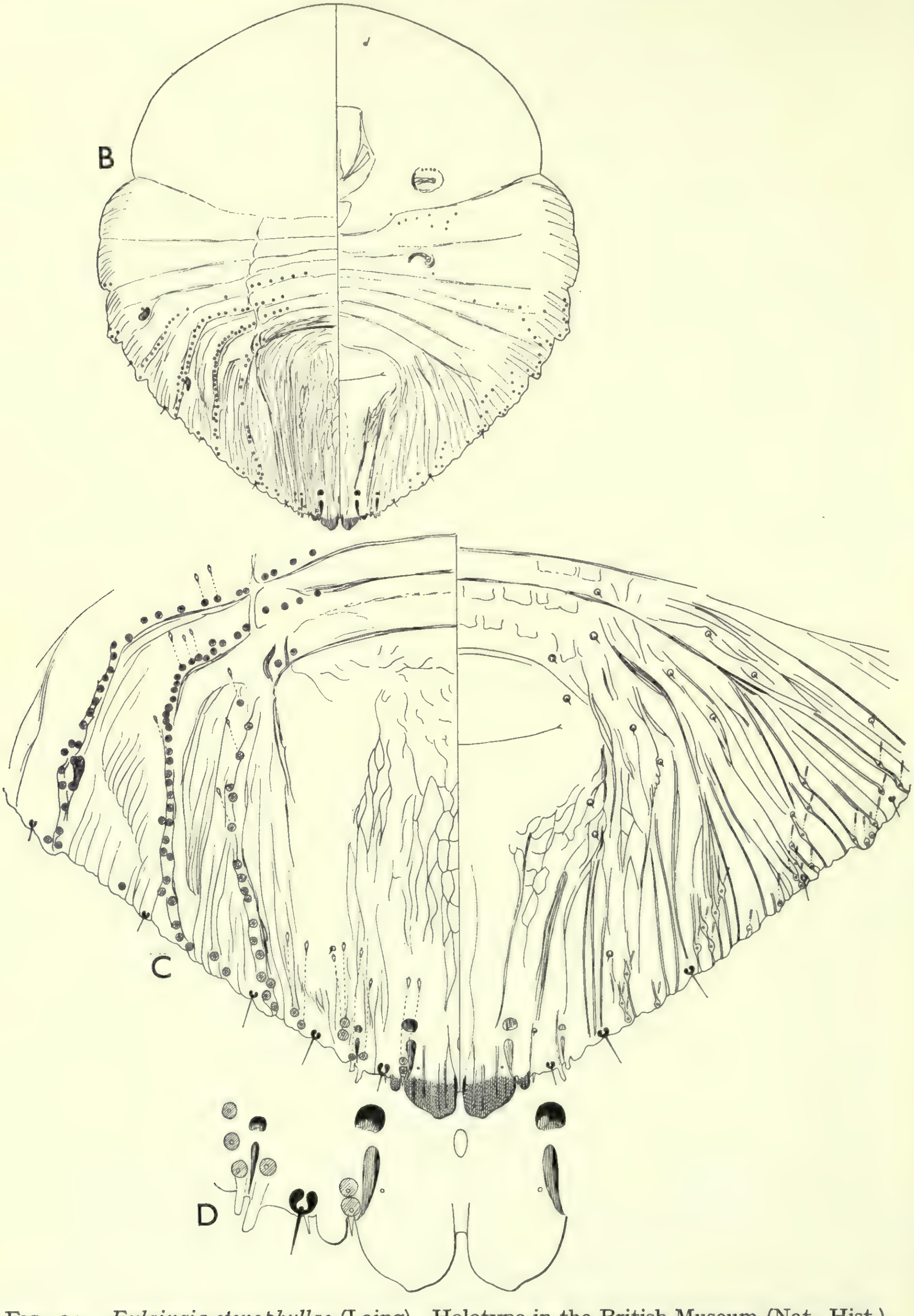

FIG. 24. *Eulaingia stenophyllae* (Laing). Holotype in the British Museum (Nat. Hist.), London. Australia: Victoria, Murray River, nr. Hattah, on *Acacia stenophylla*, (*J. E. Dixon*).

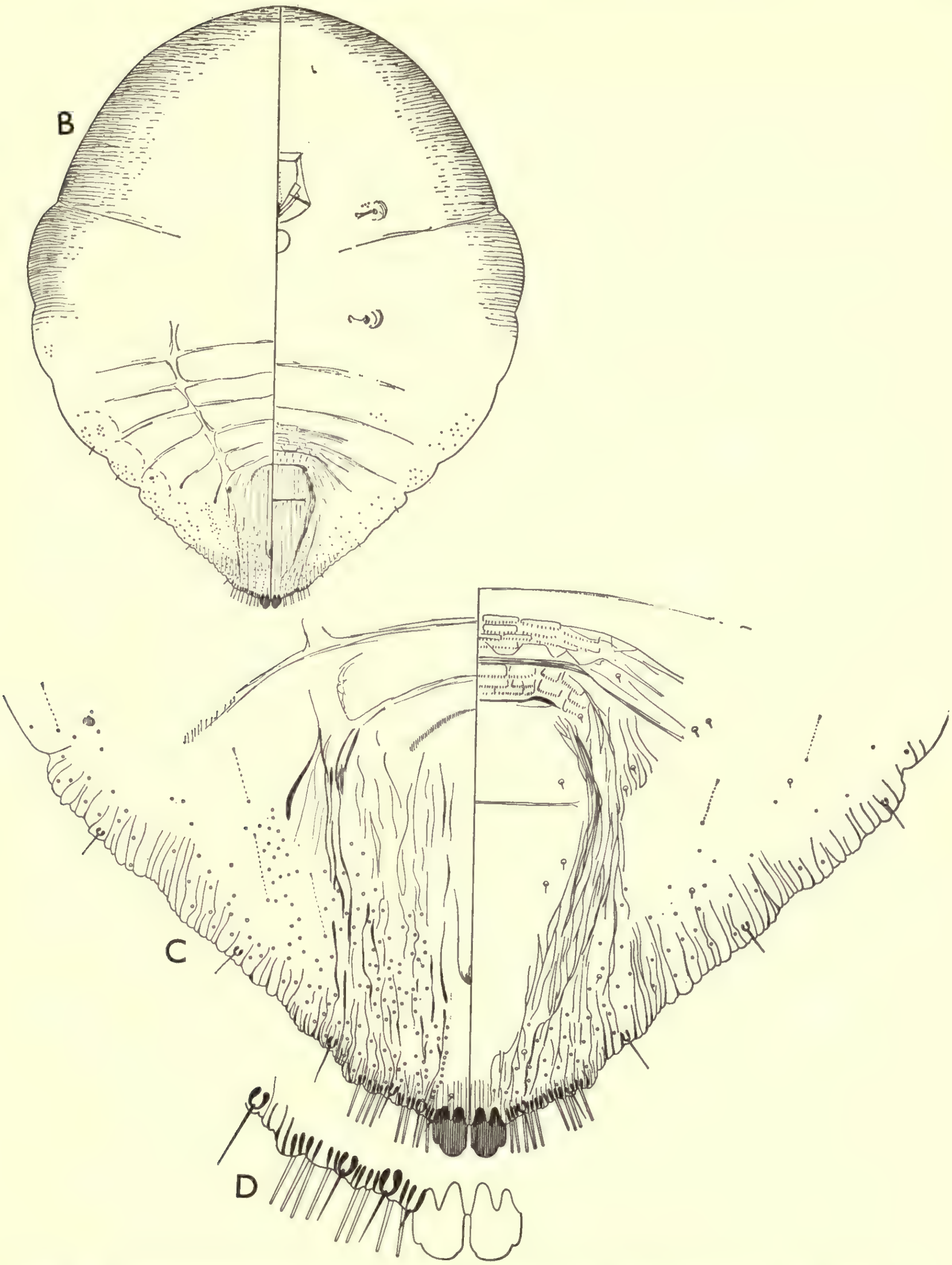

FIG. 25. *Gomphaspidiotus cuculus* (Green). Type in the British Museum (Nat. Hist.), London. Ceylon: Peradeniya, in abandoned galls of *Amorphococcus mesuae* Green on *Mesua ferrea*.

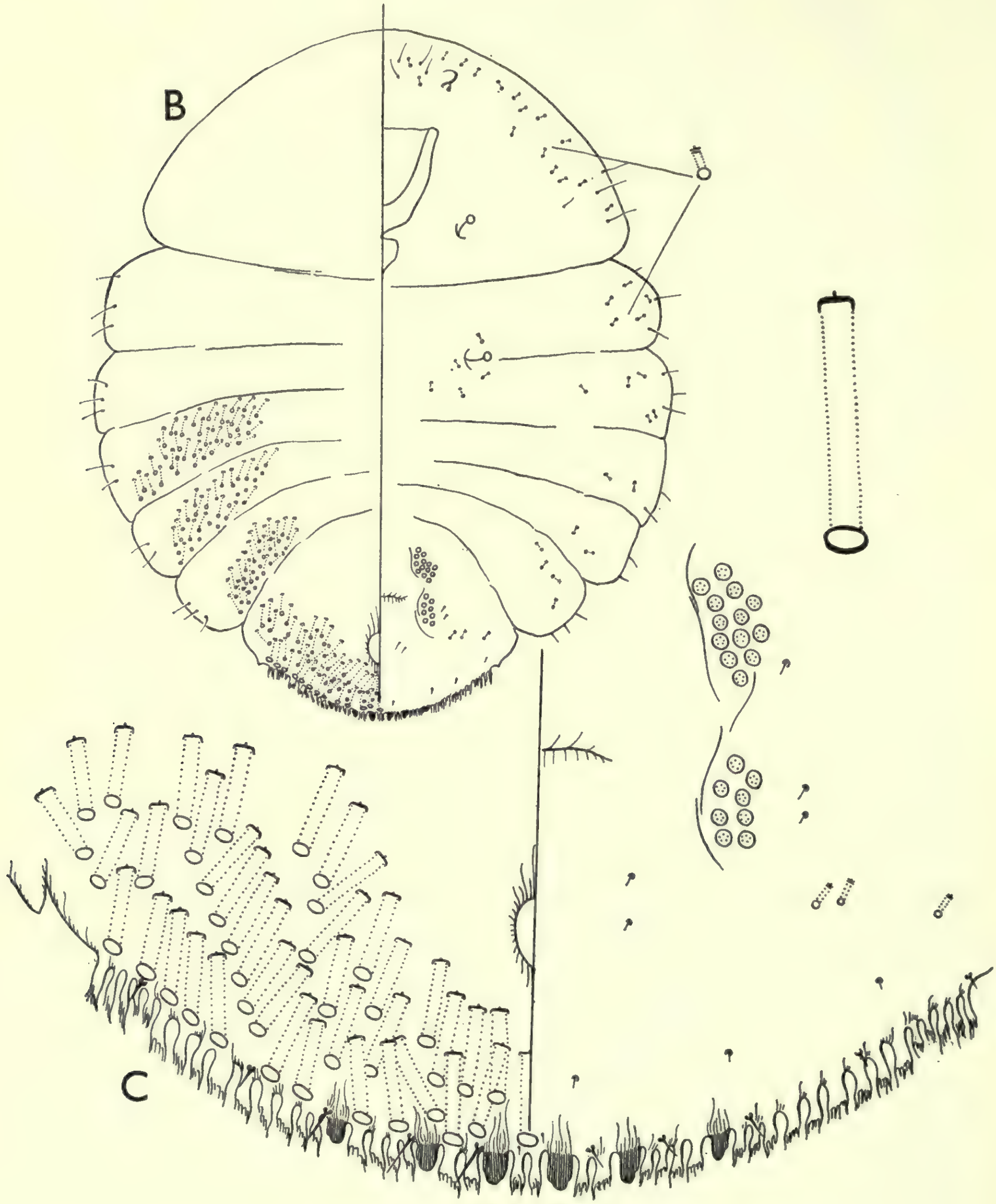

FIG. 26. *Megaspidiotus fimbriatus* (Maskell). Type material in the British Museum (Nat. Hist.), London. Australia : on *Eugenia* sp. and Australia : East Gippsland, Pescott, on leaves of *Eugenia smithii*, (*G. French*).

Scale of adult female dull brown, irregular in form due to the crowded position inside galls and inquiline habit.

With the sclerotized body at maturity and the constriction between the prothorax and mesothorax this genus belongs to the *Pseudaonidia* group. In possessing only a single pair of lobes it comes closest to the genus *Neomorgania* MacGillivray, *Diastolaspis* Brimblecombe and *Dichosoma* Brimblecombe. All of these genera possess paraphyses and the last two have fringed plates which are absent in the new genus.

MEGASPIDIOTUS Brimblecombe

(Text-fig. 26)

Megaspidiotus Brimblecombe, 1954 : 155.

Type species : *Diaspis fimbriata* Maskell, 1893, Australia.

The genus *Megaspidiotus* is a distinct one belonging to the group of genera allied to *Aspidiotus* Bouché. It differs from these genera in possessing a constriction between the prothorax and mesothorax, a character shared with the *Pseudaonidia* group but there are also constrictions on all the prepygidial segments. The three pairs of well developed lobes, the structure of the plates, the absence of stigmatic pores and the absence of an area of reticulation on the pygidium link this genus with *Aspidiotus* rather than *Pseudaonidia*.

PSEUDOMELANASPIS Borchsenius

(Text-fig. 27)

Pseudomelanaspis Borchsenius, 1952 : 262.
Pseudomelanaspis Borchsenius ; Balachowsky, 1958 : 191.

Type species : *Pseudomelanaspis minima* Borchsenius, 1952, Iran.

The genus *Pseudomelanaspis* is distinct and allied to *Melanaspis* Cockerell. It differs in having the lobes set well apart, the axes in a fan-like arrangement ; in possessing fewer paraphyses and shorter tubular ducts. Within these limits, one species is included from South Iran, outside the known distribution of *Melanaspis*.

REMOTASPIDIOTUS MacGillivray

(Text-fig. 28)

Remotaspidiotus MacGillivray, 1921 : 391.
Rhizaspidiotus MacGillivray ; Ferris, 1937 : 34.
Rhizaspidiotus MacGillivray ; Ferris, 1943 : 99.
Remotaspidiotus MacGillivray ; Brimblecombe, 1958 : 74.

Type species : *Aspidiotus* (*Targionia*) *chenopodii* Marlatt, 1908, Australia.

This genus was regarded by Ferris (1937) as being identical with *Rhizaspidiotus* MacGillivray but was resurrected by Brimblecombe (1958). Although based on

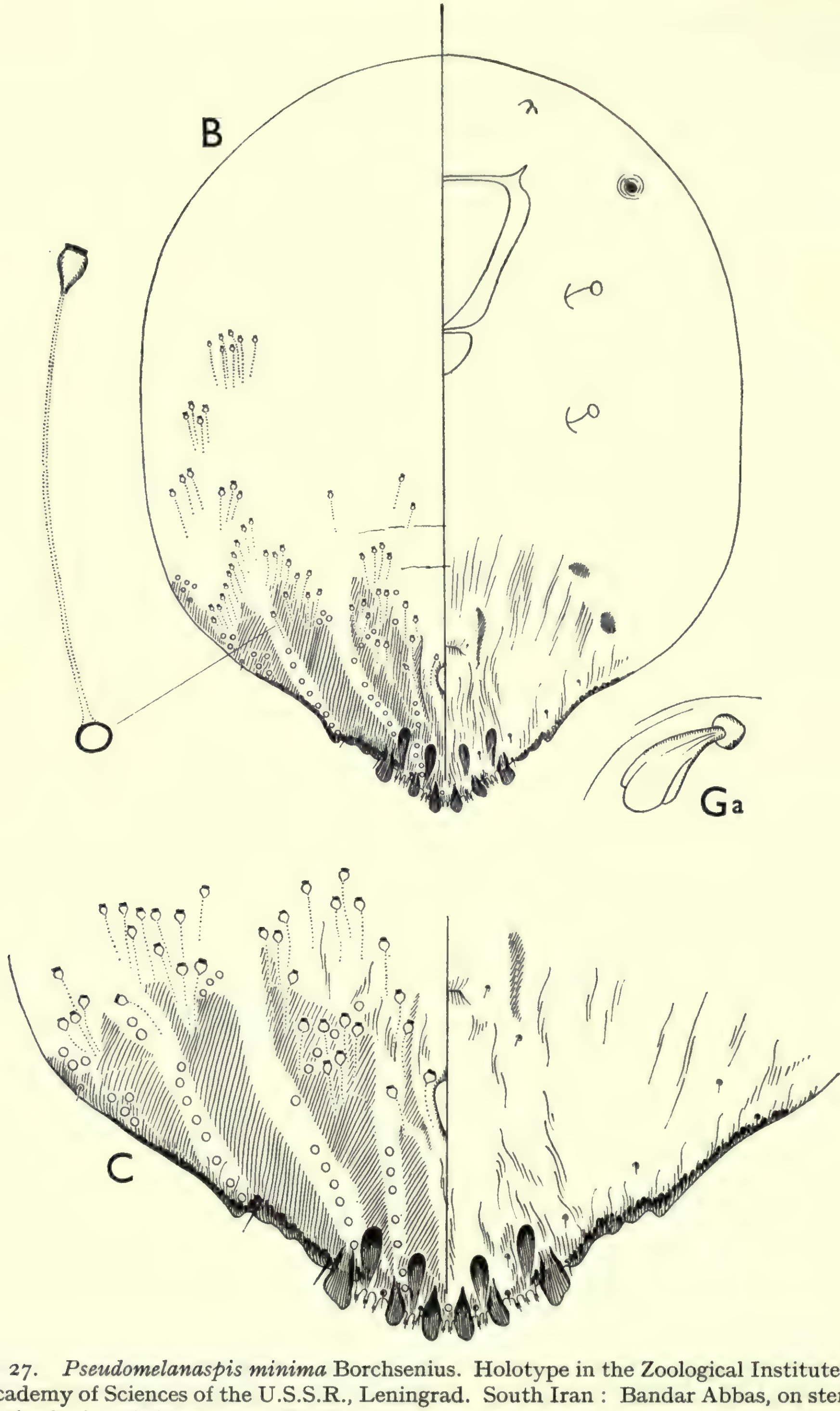

FIG. 27. *Pseudomelanaspis minima* Borchsenius. Holotype in the Zoological Institute of Academy of Sciences of the U.S.S.R., Leningrad. South Iran: Bandar Abbas, on stems of *Anabasis aphylla*, xi. 1947 (*G. Kiriukhin*).

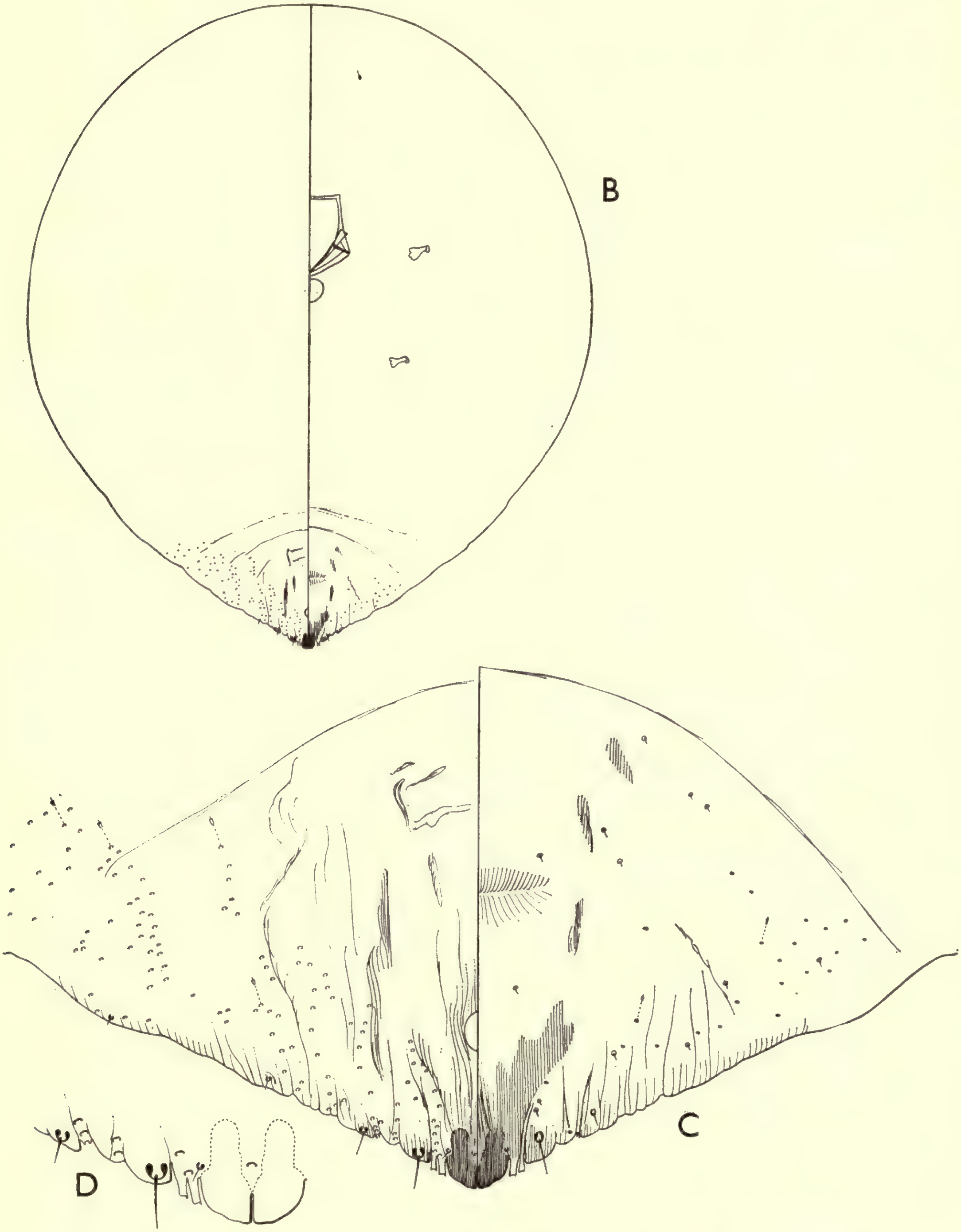

FIG. 28. *Remotaspidiotus chenopodii* (Marlatt). Type material in the British Museum (Nat. Hist.), London. Australia: New South Wales, Coolabah, on *Chenopodium*.

type material, the illustration differs slightly from the description given by Marlatt (1908) and by Brimblecombe (1958) in possessing well developed plates only in the first interlobal spaces but this may be due to the state of the specimens available. The genus comes extremely close to *Rhizaspidiotus* but now that other related Australian species have been studied there appears to be a definite group in Australia worthy of generic rank. In all the known species of *Rhizaspidiotus* the pygidial margin is deeply crenulate and the second and third lobes show some development in being somewhat sclerotized. In *Remotaspidiotus* these lobes are not apparent and if there is any sign of a swelling in the position of a second or third lobe then it is entirely membranous. The true picture will become clear when more Australian species are studied in detail.

DESCRIPTION OF FIGURES

The lettering used in the figures is as follows : A. Habit. B. Adult female, general aspect. C. Pygidium. D. Dorsal margin of pygidium. E. Ventral margin of pygidium. F. Antenna. Ga. Anterior spiracle. Gb. Posterior spiracle. H. Pygidium of second stage female.

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A REVISION OF THE WORLD SPECIES OF THE GENUS *ENDOTRICHA* ZELLER (LEPIDOPTERA : PYRALIDAE)

PAUL E. S. WHALLEY

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ENTOMOLOGY Vol. 13 No. 11
LONDON: 1963

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BY

PAUL E. S. WHALLEY

British Museum (Natural History)

Pp. 395–454 ; 37 *Plates*

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A REVISION OF THE WORLD SPECIES OF THE GENUS *ENDOTRICHA* ZELLER (LEPIDOPTERA : PYRALIDAE)

By PAUL E. S. WHALLEY

CONTENTS

SYNOPSIS

The genus *Endotricha* Zeller (Lepid., Pyralidae) is redefined and its systematic position is discussed. A key to the males is given. Of the 151 species previously included in the genus, 67 are retained, 42 are synonymised, two species cannot be recognised from their descriptions, 40 are placed in other genera and 24 new species are described. An account of the distribution and affinites of the species is given.

INTRODUCTION

THE genus *Endotricha* was erected by Zeller (1847 : 593) for the common European species, *Pyralis flammealis* Schiffermüller. Subsequently many new species were described in it and other species transferred to it. Ragonot (1891 : 511) made it the type of a new subfamily, Endotrichiinae, which has now been reduced to a tribe of the Pyralinae (Whalley, 1961 : 733). Hampson (1896*b*) revised the whole genus ; Shibuya (1928) revised the Formosan species and Inoue (1955) catalogued the Japanese species, but neither of the last two works were based on examination of the types.

There has been confusion about the identity of particular species as well as doubt as to which species belonged in *Endotricha*. A definition of the genus based on the type species has been formulated (page 399). This produces a uniform genus which is distinguished from related ones primarily by certain diagnostic characters in the male genitalia.

Ten types were not available for study. In a few cases where the identity of species is based on syntypes, this is stated in the text. In all other cases the identity of species has been established by examination of the type. A key to the males of the genus *Endotricha* is given (page 403) and terms used in the key are defined (page 403).

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Plate 11 was drawn by Mr. A. Smith. All the remaining drawings were made by Mr. M. Shaffer, who also assisted in sorting large quantities of accessions.

DEFINITION OF THE TRIBE ENDOTRICHINI (ENDOTRICHIINAE, *PARTIM*, *AUCT*.)

This tribe is part of the subfamily Pyralinae. Proboscis well developed. Maxillary palps present. Forewing with R_5 stalked with R_4 and R_3 (Pl. 12, fig. 156). Hindwing with the median vein non-pectinate, *Rs* anastomosing with *Sc* plus R_1. Chaetosema present. (Whalley, 1961 : 733).

ENDOTRICHA ZELLER, ITS SYNONYMY AND DEFINITION

Endotricha Zeller, 1847 : 593

Herrich-Shäffer, 1848 : 12. Guenée, 1854 : 218. Walker, 1859, 17 : 338. Lederer, 1863 : 344. Meyrick, 1884 : 77 and 283 ; *id.*, 1890 : 471. Ragonot, 1891 : 522. Hampson, 1896*a* : 132 ; *id.*, 1896*b* : 481. Shibuya, 1928 : 17. Inoue, 1955 : 146.

The following genera are synonyms of *Endotricha* Zeller :

Doththa Walker, 1859, 17 : 285, (*mesenterialis* Walker, by monotypy).
Messatis Walker, 1859, 19 : 918, (*sabirusalis* Walker, by monotypy).
Pacoria Walker, 1865, 34 : 1255, (*albifimbrialis* Walker). This species has been used by Hampson in the genus *Pacoria*, but a type for this genus has never been designated. I designate *albifimbrialis* Walker as the type species of *Pacoria* Walker.
Zania Walker, 1865, 34 : 1256, (*unicalis* Walker, by monotypy).
Tricomia Walker, 1865, 34 : 1259, (*auroralis* Walker, by monotypy).
Rhisina Walker, 1865, 34 : 1324, (*puncticostalis* Walker, by monotypy).
Endotrichodes Ragonot, 1891 : 521, (*perustalis* Ragonot, by monotypy).
Endotrichopsis Warren, 1895 : 467, (*rhodopteralis* Warren, by original designation).

Tegulae in male long and prominent. Male genitalia with a conspicuous sacculus process (Pl. 13, fig. 157) always present, free or partially fused to valve. Overall plan of male genitalia as in Pl. 13, fig. 157. Gnathus a simple flat plate articulating with the uncus by means of the " gnathus arms ". The gnathus may be reduced or absent, but the gnathus arms are always present. Uncus as in Pl. 13, fig. 157 with only slight variation in shape. Female genitalia with long ovipositor, extrusible on four slender apodemes. Duct of bursa variously modified. Bursa with at least one signum (except in *E. puncticostalis* Walk.). The bursa may also have one or more patches of spines, in some cases they form a second signum.

Type species of the genus, *E. flammealis* Schiffermüller (by monotypy). As defined above, many of the species formerly placed in the genus are now removed from it. The new definition limits the genus to species with a very constant plan in the male and female genitalia.

AFFINITIES WITH OTHER GENERA IN THE ENDOTRICHINI

The genus most closely related to *Endotricha* is *Oeogenes* Meyrick, with type *O. fugalis* Felder which has a male genitalic structure almost identical with *Endotricha*, but lacks the gnathus and gnathus arms. The nearest approach to this form in *Endotricha* is in the species where the gnathus is reduced or absent, but in these the gnathus arms are always present. The female genitalia of the two genera are similar.

The lack of the gnathus and gnathus arms is sufficient to place *O. fugalis* in a separate genus. Many of the genera in the old subfamily Endotrichiinae have been moved to other subfamilies (Whalley, 1961 : 733). The true Endotrichini, which come within the definition on page 398, all show a similar genitalic pattern to *Endotricha flammealis* Schiff., and some are very similar externally.

Biology

Hardly anything is known of the biology of *Endotricha*. Buckler (1882 : 149 ; *id.* 1901 : 57) has recorded the life history of the common European species, *E. flammealis* Schiff., which feeds on flowers and leaves of *Lotus* sp., *Salix* sp. and other shrubs. The food plants of the other species in the genus have not been published.

GEOGRAPHICAL DISTRIBUTION

Endotricha is an Old World genus. Apart from North and South America and Hawaii, species occur in all other continents and most islands. The Australasian-Pacific region is the richest in species and may have been the centre of origin of the genus. Species of *Endotricha* occur in Tahiti and the Austral Islands, in Fiji and Samoa, the Marianas and Caroline Islands, the Philippines and the island chain from Australia to Malaya. I have not seen specimens from the Marshall Islands although species of the genus probably occur there also.

Many Pacific and Oriental species show a high degree of speciation on islands and mountain ranges which suggests that geographic isolation plays an important part in the speciation of this group. This is particularly apparent in three species forming the *rhodomicta* species group, *E. rhodomicta*, *E. aureorufa*, and *E. munroei*, which

are similar externally (Pl. 7, figs. 92, 93, 95 and 97) and have similar genitalia but appear to have differentiated on different mountain ranges in New Guinea. I prefer to regard them as members of a superspecies complex rather than subspecies of one species. The production of distinct species on islands is shown by the *simplex* species group where two species of *Endotricha*, very distinct in external appearance, have arisen in the Moluccas.

The Palaearctic species, *E. flammealis*, is unusual for the apparent lack of geographical subspeciation, although widespread over the whole region. It is very variable in colour but the individual variants are found over the whole range.

The small island of São Thomé off the coast of West Africa contains four endemic and very distinct species with a genitalic pattern which suggests that they were derived from the widespread African species, *E. erythralis*. This species, although variable to some extent, has not differentiated very much over the whole of the Ethiopian region. There is no apparent seasonal variation in the São Thomé material and it seems probable, since the genitalia are identical, that the four species are in fact ecologically separated in some way.

The *mesenterialis* species group contains some very widespread species and others with a restricted distribution. *E. mesenterialis* occurs from India to Australia with relatively small differences between specimens at the extremes of the range.

In Samoa, the New Hebrides and Loyalty Islands there have arisen two distinct species (*E. plinthopa* and *E. propinqua*), which show distinct signs of affinity with the parent species (*E. mesenterialis*) in such morphological characters as antennal processes and the flattening of the crown of the head. Anatomically, the genitalia conform to the same pattern which characterises this group, but externally the species are distinct (Pl. 5, figs. 61–68).

The nominate subspecies of *E. mesenterialis* occurs in the New Hebrides alongside *E. propinqua* and, in Samoa, *E. mesenterialis obscura* occurs with *E. plinthopa*. Although some similarities exist between *E. plinthopa* and *E. propinqua*, I think that they both arose independently from *E. mesenterialis*. It would appear that both the New Hebrides and Samoa were subject to at least two " invasions " of *E. mesenterialis*. After the first invasion the population was sufficiently differentiated, or ecologically separated, by the time the second invasion took place not to breed with the newcomers.

E. sexpunctata and *E. mariana* from the Marianas Is. are separated from their nearest relative by over one thousand miles. However, while the male genitalia of both species are very similar to *E. mesenterialis*, their external appearance is unlike that of any other known species of *Endotricha*.

The subspecies *E. mesenterialis mahensis* from the Seychelles is distinct externally from the mainland subspecies, but the genitalia are similar. The other subspecies, *E. mesenterialis obscura*, is not so clearly differentiated, but is generally larger and with the colour pattern more clearly defined. The genitalia are constant and similar to those of the nominate subspecies of which it represents the southern part of the range from the Orient.

The species of the *costaemaculalis* species group all have the same type of " T "-shaped uncus. *E. costaemaculalis* can best be regarded as a superspecies. The

Palaearctic specimens differ distinctly on external characters from the North Indian. There is, however, a gradation of these characters through Tibet and China. There is a second North Indian species, *E. eximia*, which is very similar to *E. costaemaculalis* in general appearance but differs in some details. In order to clarify the situation, since *E. eximia* occurs in the same area as *E. costaemaculalis fuscifusalis*, it is described as a new species rather than a subspecies of *E. costaemaculalis*.

In the following section the distribution of each species is summarised. Details of the known distribution will be found under " Material examined " for each species. In most cases previous accounts of the distribution are unreliable because of doubtful identification. Intensive collecting in limited areas (e.g., Assam, Khasi Hills) gives a somewhat one-sided impression of the distribution of the species in this genus.

The regions used are modified from Sclater (1858, *J. Linn. Soc. Lond.*, 2 : 130) as given by de Beaufort, 1951, p. 9 (*Zoogeography of the Land and Inland Waters*, Sidgewick Jackson Ltd., London).

Ethiopian Region

Continental Africa

centripunctalis (p. 445) ; *consobrinalis consobrinalis* (p. 417) ; *ellisoni* (p. 418) ; *erythralis* (p. 421) ; *niveifimbrialis* (p. 418) ; *rosina* (p. 419) ; *vinolentalis* (p. 419).

Madagascar

consobrinalis meloui (p. 417) ; *erythralis* (p. 421).

Socotra

erythralis (p. 421).

São Thomé

altitudinalis (p. 420) ; *tamsi* (p. 419) ; *thomealis* (p. 420) ; *viettealis* (p. 420).

Palaearctic Subregion

consobrinalis consobrinalis (p. 417) ; *consocia* (p. 410) ; *costaemaculalis costaemaculalis* (p. 427) ; *costaemaculalis fuscifusalis* (p. 427) ; *flammealis* (p. 409) ; *flavofascialis flavofascialis* (p. 413) ; *flavofascialis affinialis* (p. 413) ; *hœnei* (p. 430) ; *icelusalis* (p. 413) ; *kuznetzovi* (p. 412) ; *luteobasalis* (p. 434) ; *olivacealis* (p. 422) ; *portialis* (p. 421) ; *punicea* (p. 414) ; *ragonoti* (p. 409) ; *rogenhoferi* (p. 417) ; *similata* (p. 426) ; *theonalis* (p. 410).

Oriental Region

Indian subcontinent ; India, Pakistan, Afghanistan, Nepal, Goa, Bhutan, Assam ; Ceylon and the Seychelles.

albicilia (p. 437) ; *ardentalis* (p. 426) ; *costaemaculalis fuscifusalis* (p. 427) ; *decessalis decessalis* (p. 410) ; *eximia* (p. 428) ; *fuscobasalis* (p. 428) ; *loricata* (p. 415) ; *luteogrisalis* (p. 414) ; *melanobasis* (p. 429) ; *mesenterialis mesenterialis* (p. 423) ; *mesenterialis mahensis* (p. 423) ; *nigromaculata* (p. 429) ; *olivacealis* (p. 422) ; *ragonoti* (p. 409) ; *rufofimbrialis* (p. 434) ; *ruminalis* (p. 415) ; *similata* (p. 426).

Burma, Malaya, Nicobar Islands, Andaman Islands

albicilia (p. 437) ; *borneoensis* (p. 431) ; *decessalis decessalis* (p. 411) ; *decessalis major* (p. 411) ; *flavifusalis* (p. 434) ; *mesenterialis mesenterialis* (p. 423) ; *nicobaralis* (p. 441) ; *olivacealis* (p. 422) ; *ruminalis* (p. 415) ; *semirubrica* (p. 435) ; *similata* (p. 426) ; *trichophoralis* (p. 414).

Borneo—including Sarawak and Pulo Laut—Java and Sumatra

affinitalis (p. 415) ; *approximalis* (p. 440) ; *borneoensis* (p. 431) ; *decessalis major* (p. 411) ; *denticostalis* (p. 436) ; *flavifusalis* (p. 434) ; *mesenterialis mesenterialis* (p. 423) ; *olivacealis* (p. 422) ; *portialis* (p. 421) ; *rufofimbrialis* (p. 434) ; *sandaraca* (p. 435) ; *semirubrica* (p. 435) ; *suavalis* (p. 426) ; *trichophoralis* (p. 414).

Formosa

consocia (p. 410) ; *costaemaculalis formosensis* (p. 427) ; *metacuralis* (p. 430) ; *olivacealis* (p. 422) ; *portialis* (p. 421) ; *ruminalis* (p. 415) ; *theonalis* (p. 410).

Philippines

wilemani (p. 416) ; *approximalis* (p. 440).

Australasian-Pacific Region

Australia, including one species recorded from New Zealand, marked " * "

approximalis (p. 440) ; *chionocosma* (p. 437) ; *dispergens* (p. 440) ; *euphiles* (p. 432) ; *hemicausta* (p. 411) ; *ignealis* (p. 422) ; *lobibasalis* (p. 442) ; *melanochroa* (p. 412) ; *mesenterialis obscura* (p. 424) ; *occidentalis* (p. 411) ; *psammitis* (p. 441) ; *puncticostalis* (p. 416) ; *pyrosalis** (p. 440) ; *pyrrhocosma* (p. 444).

New Guinea, Dampier I., Louisiade Archipelago, Moluccas, Bismarck Archipelago, Bali

approximalis (p. 440) ; *aureorufa* (p. 433) ; *borneoensis* (p. 431) ; *chionosema* (p. 442) ; *conchylaria* (p. 436) ; *coreacealis* (p. 441) ; *cruenta* (p. 438) ; *encaustalis* (p. 440) ; *faceta* (p. 431) ; *fastigia* (p. 429) ; *flavifusalis* (p. 434) ; *fuliginosa* (p. 437) ; *gregalis* (p. 421) ; *lobibasalis* (p. 442) ; *melanochroa* (p. 412) ; *mesenterialis mesenterialis* (p. 423) ; *mesenterialis obscura* (p. 424) ; *munroei* (p. 433) ; *murecinalis* (p. 421) ; *persicopa persicopa* (p. 432) ; *persicopa paliolata* (p. 432) ; *pyrrhaema* (p. 443) ; *pyrrhocosma* (p. 444) ; *thermidora* (p. 444) ; *rhodomicta*(p. 432) ; *simplex simplex* (p. 439) ; *simplex rosselli* (p. 439) ; *variabilis* (p. 439).

Solomon Is., New Hebrides, Loyalty Is., Fiji, Tonga, Samoa, New Caledonia, Kermadec Is., Norfolk I., Tahiti, Marianas Is., Caroline Is.

approximalis (p. 440) ; *argentata* (p. 425) ; *borneoensis* (p. 431) ; *bradleyi* (p. 444) ; *capnospila* (p. 437) ; *dyschroa* (p. 442) ; *luteopuncta* (p. 442) ; *mariana* (p. 444) ; *mesenterialis mesenterialis* (p. 423) ; *mesenterialis obscura* (p. 424) ; *peterella* (p. 443) ; *plinthopa* (p. 424) ; *propinqua* (p. 424) ; *thermidora* (p. 444) ; *separata* (p. 445) ; *sexpunctata* (p. 425) ; *wammeralis* (p. 445).

DEFINITION OF TERMS USED

Basal process of valve.—A digitate process at the base of the valve (Pl. 13, fig. 157).

Bursa.—Includes ductus bursa and bursa copulatrix.

Chaetosema.—Small pad with hair-like scales on dorsal side of head, one chaetosema posterior to each eye.

Coremata. Large scale tufts on the last segment of the abdomen of the male.

Cornutus (*–i*). Spine or spines on vesica inside the aedeagus, only clearly seen when vesica has been everted.

Costal hairs (usually used as the term " *reflexed costal hairs* "). Pl. 13, fig. 157. These are modifications of from two to six scales on the costal margin of the valve in the male genitalia. In some specimens the hairs may be broken off but the enlarged socket where they were attached is always visible. Fine reflexed hairs are often present on the costa of the valve but they are lightly attached to the valve and their sockets are minute. These fine hairs are usually removed in the ordinary course of making a microscope mount.

Gnathus. Pl. 13, fig 157.

Gnathus arms. Pl. 13, fig. 157.

Juxta. Pl. 13, fig. 157.

Patagia. Collar of scales immediately posterior to the head.

Sacculus process. Pl. 13, fig. 157. Large, spine-like process at ventral margin of valve which may be variously modified.

Signum. A definite patch of spines, usually circular or oval, on the bursa of the female.

Socii. Pl. 13, fig. 157.

Subscaphium. A sclerotised portion of the ventral part of the anal tube.

Tegulae. Long, backward projecting scale-tufts on the tegular plates.

Uncus. Pl. 13, Fig. 157.

Uncus process. Pl. 13, fig. 157. This may be absent, but, when present, it is always paired and may take the form of a single pair of spines, several small spines or two raised papillae covered with spines.

Wing " x mm.". Mean wing measurement taken from apex of forewing to centre of mesothorax.

Wingspan. Largest possible total expanse of both forewings.

KEY TO THE MALES OF THE GENUS

The definition of terms used in this key are given above. The following species are known from the female only and are thus not included in the key: *affinitalis* Hering, *ardentalis* Hampson, *chionocosma* Turner, *sondaicalis* Snellen, *wilemani* West.

1		Costa strongly concave, apex of wing very pointed, as in Pl. 7, fig. 91	***fastigia*** (p. 429)
—		Costa not as strongly concave as Pl. 7, fig. 91	2
2	(1)	Underside of forewing with oval white patch of scales in anal area. Hindwing with a large white patch over cell	***chionosema*** (p. 442)
—		No oval white patch in anal area of fore wing. No white over cell in hindwing	3

3 (2) Labial palps extending well above vertex of head (Pl. 11, fig. 153) . ***portialis*** (p. 421)
— Labial palps not extending above vertex of head 4

4 (3) Costal margin of forewing with basal part enlarged . . ***lobibasalis*** (p. 442)
— Basal part of costal margin of forewing not enlarged 5

5 (4) Basal part of costa of forewing with strongly modified scale-tuft projecting beyond costa, outer part of costa unmodified . . . ***trichophoralis*** (p. 414)
— Basal part of costa of forewing unmodified, without scale-tufts or entire costal margin toothed 6

6 (5) Costal margin of forewing with scales modified along the edge giving a strongly toothed appearance to costa . . . . ***denticostalis*** (p. 436)
— Costa of forewing not toothed 7

7 (6) Apex of forewing distinctly truncate (Pl. 9, fig. 123) . . ***dispergens*** (p. 440)
— Apex of forewing not distinctly truncate 8

8 (7) Large, black, sharply defined, rectangular patch in posterior part of basal area of forewing (Pl. 6, fig. 84) . . . . . . ***nigromaculata*** (p. 429)
— No black rectangular patch in basal area of forewing 9

9 (8) Large black patch in cell on underside of forewing. Long, yellow, hair-like scales in anal area on underside of forewing . . . ***fuliginosa*** (p. 437)
— Forewing without black patch or modified scales 10

10 (9) Black, oval patch covering base of veins Cu_{1a} and M_3 in upper side of hindwing . . . . ***capnospila*** (p. 437)
— Hindwings without black basal patch 11

11 (10) Large yellow spot in forewing between veins 1*A* and Cu_{1b} . ***luteopuncta*** (p. 442)
— No yellow spot between veins 1*A* and Cu_{1b} 12

12 (11) Yellow spot in forewing at apex of cell . . . . ***kuznetzovi*** (p. 412)
— Forewing without yellow spot at apex of cell 13

13 (12) Basal process on valve of male genitalia prominent 14
— No basal process on valve 22

14 (13) No reflexed hairs on costal margin of valve 15
— Reflexed hairs present 16

15 (14) Uncus process a group of spines on each side. Juxta with central keel. Basal process long, curved (Pl. 20, fig. 199) . . . . . ***melanobasis*** (p. 429)
— Uncus process one spine on each side (Pl. 19, fig. 191). Juxta simple, basal process not curved . . . . ***olivacealis*** (p. 422)

16 (14) Silvery-grey species. Sacculus process truncate (Pl. 18, fig. 189) ***argentata*** (p. 425)
— Otherwise coloured. Sacculus process pointed or truncate 17

17 (16) Two large hyaline areas on each forewing, large oval hyaline area on each hindwing. Sacculus process truncate (Pl. 18, fig. 188) . . ***sexpunctata*** (p. 425)
— Otherwise coloured. Sacculus process truncate or pointed 18

18 (17) Juxta pitted all over 19
— Juxta smooth except for a few spines in the centre of the posterior margin . 20

19 (18) Dark reddish species with prominant median white area. Sacculus as in Pl. 19, fig. 195 . . . . ***propinqua*** (p. 424)
— Pale coloured species. Median white area not sharply defined. Sacculus process as in Pl. 19, fig. 192 . . . . ***plinthopa*** (p. 424)

20 (18) Wing span 18·5 mm. or over . . . . . ***mesenterialis obscura*** (p. 424)
— Wing span less than 18·5 mm. 21

21 (20) Fore- and hindwings with white, clearly defined median area . . . ***mesenterialis mahensis*** (p. 423)
— Fore- and hindwings with median area yellowish, not sharply defined . . . ***mesenterialis mesenterialis*** (p. 423)

22 (13) Reflexed hairs present on costal margin of valve 23
— Reflexed hairs absent 52

23 (22) Sacculus process simple 29
— Sacculus process enlarged (Pl. 27, figs. 238–242) or truncate (Pl. 23, fig. 217) . 24

24 (23) Sacculus process truncate (Pl. 23, fig. 217). Cornutus as in Pl. 23, fig. 217 ***conchylaria*** (p. 436)
— Sacculus process not truncate. Cornutus not as in Pl. 23, fig. 217 25

25 (24) Forewings with conspicuous, white, zig-zag, post-median fascia. General colour of forewings dark brown and black with prominent white median area. Cornutus as in Pl. 28, fig. 246 . . . . ***mariana*** (p. 444)
— Forewing colour not as above. Cornutus not as in Pl. 28, fig. 246 . . . 26

26 (25) Basal and median area of forewings reddish purple. Rest of forewings and hindwings almost unmarked, dirty white. Cornutus as in Pl. 28, fig. 247 ***bradleyi*** (p. 444)
— Forewings otherwise coloured 27

27 (26) Basal area of hindwings deep chestnut red. Median area of hindwing whitish. Cornutus as in Pl. 28, fig. 245 . . . . ***pyrrhocosma*** (p. 444)
— Hindwings otherwise coloured 28

28 (27) General colour reddish brown. Median area not conspicuously demarcated. Large species, over 14 mm. wingspan. Cornutus as in Pl. 28, fig. 243 ***thermidora*** (p. 444)
— Smaller species, under 14 mm. wingspan. Hindwing with broad yellow median area, narrowing posteriorly. Cornutus as in Pl. 28, fig. 244 . ***separata*** (p. 445)

29 (23) Underside of forewings with conspicuous brown scales over base of veins Cu_{1b} and Cu_{1a} . . . . ***coreacealis*** (p. 441)
— No brown scales as above 30

30 (29) Underside of forewing with purplish patch along costal margin, demarcated by the veins . . . . ***pyrosalis*** (p. 440)
— Not as above 31

31 (30) Cornutus very long and spiny (Pl. 25, fig. 231 and Pl. 26, fig. 237) 32
— Cornutus not long and spiny 33

32 (31) Pinky red species. Gnathus apparently absent. Genitalia as in Pl. 26, fig. 237 ***pyrrhaema*** (p. 443)
— Grey brown species. Gnathus present. Genitalia as in Pl. 25, fig. 231 ***peterella*** (p. 443)

33 (31) Manica of aedeagus with prominent spines. Genitalia as in Pl. 24, fig. 225 ***encaustalis*** (p. 440)
— No prominent spines on manica 34

34 (33) Uncus process present 35
— Uncus process absent 38

35 (34) Genitalia as in Pl. 26, fig. 235 . . . . ***approximalis*** (p. 440)
— Genitalia not as in Pl. 26, fig. 235 36

36 (35) Wingspan 20 mm. or over . . . . ***albicilia*** (p. 437)
— Wingspan less than 20 mm. 37

37	(36)	Sacculus process short. Uncus processes widely separate. Gnathus blunt (Pl. 18, fig. 187)	***rogenhoferi*** (p. 417)
—		Sacculus process long. Uncus process joined in mid-line. Gnathus pointed (Pl. 26, fig. 234)	***nicobaralis*** (p. 441)
38	(34)	Base of sacculus very spiny (Pl. 18, fig. 184)	***niveifimbrialis*** (p. 418)
—		Base of sacculus not spiny	39
39	(38)	Aedeagus with cornutus consisting of 5 or 6 spines. Forewing with R_3 arising before R_5 on common stem of R_{3+4+5}	***ignealis*** (p. 422)
—		Cornutus not as above. R_3 arising after R_5 on common stem of R_{3+4+5}	40
40	(39)	Cornutus minute, vesica covered with small spines. Sacculus process upturned (Pl. 16, fig. 175)	***vinolentalis*** (p. 419)
—		Cornutus large. Sacculus process straight or upturned	41
41	(40)	Specimens from Ethiopian or Madagascan Region	42
—		Specimens from other zoogeographical regions	46
42	(41)	Cornutus rounded, short. General colour of wings purplish-red	***erythralis*** (p. 421)
—		Cornutus slightly hooked. (Pl. 17, fig. 176). Wings variously coloured	43
43	(42)	Prominent zig-zag fascia across forewing	44
—		No zig-zag fascia across forewing	45
44	(43)	General colour of forewing brown	***altitudinalis*** (p. 420)
—		Forewings olive-green	***thomealis*** (p. 420)
45	(43)	Forewings chololate brown. Prominent white patch near inner edge of hind margin of forewing	***tamsi*** (p. 419)
—		Forewings pale pinky-red with thin, almost obscure, white median fascia	***viettealis*** (p. 420)
46	(41)	Cornutus hooked, genitalia as in Pl. 17, fig. 178	***murecinalis*** (p. 421)
—		Cornutus not hooked	47
47	(46)	Underside of hindwing with black ante- and post-median fascia, very conspicuous. Wingspan 28–30 mm.	***variabilis*** (p. 439)
—		Otherwise coloured	48
48	(47)	Sacculus process strongly upturned (Pl. 17, fig. 179). General colour of forewings grey	***gregalis*** (p. 421)
—		Sacculus process straight or only slightly upturned. Forewings not grey	49
49	(48)	Circular patch of yellow or white scales in anal area on underside of forewing	***simplex rosselli*** (p. 439)
—		Not as above	50
50	(49)	Bright red and yellow species. Wingspan under 20 mm.	***cruenta*** (p. 438)
—		Not as above. Wingspan over 20 mm.	51
51	(50)	Wingspan over 25 mm. Genitalia as in Pl. 24, fig. 220	***simplex*** (p. 439)
—		Wingspan less than 25 mm. Genitalia as in Pl. 25, fig. 228	***dyschroa*** (p. 442)
52	(22)	Uncus process present	53
—		Uncus process absent	80
53	(52)	Basal process present	***melanobasis*** (p. 429)
—		No basal process	54
54	(53)	Uncus process simple on each side or uncus process absent	55
—		Uncus process a group of spines on each side	61
55	(54)	Cornutus bifurcate, Y-shaped. Manica with strong spines	56
—		Cornutus not Y-shaped, or cornutus absent	57

56	(55)	Forewings dark. Thin, indistinct yellow median fascia	***flavofascialis affinialis*** (p. 413)
—		Forewings reddish with broad median yellow fascia	***flavofascialis flavofascialis*** (p. 413)
57	(55)	Uncus " T "-shaped. Sacculus process strongly reflexed (Pl. 23, fig. 215)	***semirubrica*** (p. 435)
—		Uncus not " T "-shaped. Sacculus process not reflexed	58
58	(57)	Cornutus large and conspicuous	59
—		Cornutus small or absent	60
59	(58)	Sacculus process wavy, prominent crosspiece (Pl. 26, fig. 236)	***psammitis*** (p. 441)
—		Sacculus process straight, upturned at end, no crosspiece	***decessalis*** (p. 410)
60	(58)	Broad yellow median area in hindwing. Sacculus process straight. Valve outline wavy (Pl. 15, fig. 168)	***icelusalis*** (p. 413)
—		Median area of hindwing narrow. Sacculus process with small projection at end. Valve outline not wavy (Pl. 16, fig. 172)	***loricata*** (p. 415)
61	(54)	Juxta with a prominent pair of spiny apical processes (Pl. 19, fig. 193)	***fuscobasalis*** (p. 428)
—		No spiny processes at apex of juxta	62
62	(61)	Sacculus with two pairs of arms (Pl. 20, fig. 201)	***borneoensis*** (p. 431)
—		Sacculus process simple	63
63	(62)	Sacculus process truncate. Genitalia as in Pl. 20, fig. 200	***faceta*** (p. 431)
—		Sacculus process not truncate. Process either straight or recurved	64
64	(63)	Sacculus process straight or wavy, end of process straight or slightly upturned, never recurved	71
—		Sacculus process strongly recurved on itself	65
65	(64)	Dark coloured species never pinky red and yellow. Socii pointed. Genitalia as in Pl. 20, fig. 197	***similata*** (p. 426)
—		Otherwise coloured. Socii not pointed. Genitalia different from Pl. 20, fig. 197	66
66	(65)	Hindwings with reddish purple patch covering, at least, terminal area enclosed by *Sc* to M_1	67
—		No reddish purple in this position on hindwing, most of hindwing yellow with reddish median fascia	69
67	(66)	Reddish purple fascia covering terminal part of all hindwing veins except *3A*	68
—		Reddish purple terminal fascia of hindwing ending at M_3, occasionally reaching Cu_{1a}	***persicopa persicopa*** (p. 432)
68	(67)	Uncus " T "-shaped (Pl. 21, fig. 205)	***euphiles*** (p. 432)
—		Uncus not " T "-shaped (Pl. 21, fig. 207)	***persicopa paliolata*** (p. 432)
69	(66)	Juxta without any keels (Pl. 22, fig. 210)	***munroei*** (p. 433)
—		Juxta with keels (Pl. 22, figs. 208 and 209)	70
70	(69)	Juxta with one median keel (Pl. 22, fig. 209)	***aureorufa*** (p. 433)
—		Juxta with two lateral keels (Pl. 22, fig. 208)	***rhodomicta*** (p. 432)
71	(64)	Juxta strongly constricted (Pl. 19, fig. 194)	***hœnei*** (p. 430)
—		Juxta simple, no constriction	72
72	(71)	Uncus not " T "-shaped. Sacculus process upturned, ending in a fine point (Pl. 21, fig. 204)	***metacuralis*** (p. 430)
—		Uncus " T "-shaped	73
73	(72)	Aedeagus with two cornuti. Genitalia as in Pl. 22, fig. 213	***sandaraca*** (p. 435)
—		Genitalia not as in Pl. 22, fig. 213	74

74 (73)	Pinky red and yellow species	75
—	Otherwise coloured	76
75 (74)	Uncus process as in Pl. 23, fig. 214. No cornutus . .	***flavifusalis*** (p. 434)
—	Uncus process as in Pl. 22, fig. 211. Cornutus present .	***rufofimbrialis*** (p. 434)
76 (74)	Large species, wingspan over 20 mm. Broad, white, median fascia in fore, and hind wings. Genitalia as in Pl. 20, fig. 198	***suavalis*** (p. 426)
—	Not as above	77
77 (76)	Hindwings whitish. Cornutus a row of spines, Pl. 21, fig. 202 .	***eximia*** (p. 428)
—	Not as above	78
78 (77)	Gnathus truncate, Pl. 22, fig. 212. Genitalia as in Pl. 22, fig 212	***luteobasalis*** (p. 434)
—	Gnathus pointed, Pl. 20, fig. 196. Genitalia as in Pl. 20, fig. 196	79
79 (78)	Forewings with narrow median white line enlarged on costal margin. General colour purplish red	***costaemaculalis costaemaculalis*** (p. 427)
—	Indistinct median white line on forewings. General colour blackish grey-brown	***costaemaculalis fuscifusalis*** (p. 427) and ***costaemaculalis formosensis*** (p. 427)
80 (52)	Base of sacculus process enlarged and strongly spiny, Pl. 16, figs. 173, 174 .	81
—	Base of sacculus process simple, no spines	82
81 (80)	Base of sacculus process short and broad, process short (Pl. 16, fig. 174)	***rosina*** (p. 419)
—	Base of sacculus process long and narrow, process long and upturned (Pl. 16, fig. 173)	***ellisoni*** (p. 418)
82 (80)	Sacculus process broad, truncate	83
—	Sacculus process pointed, never truncate	84
83 (82)	Large cornutus	***theonalis*** (p. 410)
—	No cornutus	***punicea*** (p. 414)
84 (82)	Cornutus small and inconspicuous	85
—	Cornutus large and conspicuous	86
85 (84)	Sacculus process short (Pl. 18, fig. 183)	***puncticostalis*** (p. 416)
—	Sacculus process long and thin (Pl. 18, fig. 182)	***consobrinalis consobrinalis*** (p. 417)
86 (84)	Hindwings yellow	***hemicausta*** (p. 411)
—	Hindwings not yellow	87
87 (86)	Basal area of forewing black, hindwings unmarked . . .	***melanochroa*** (p. 412)
—	Not as above	88
88 (87)	Genitalia as in Pl. 14, fig. 160	***consocia*** (p. 410)
—	Genitalia not as in Pl. 14, fig. 160	89
89 (88)	Fore- and hindwings with a distinct, clearly defined, broad median fascia .	90
—	Fore- and hindwings not as above	91
90 (89)	Fore- and hindwing median fascia pale lemon yellow. Oriental species	***luteogrisalis*** (p. 414)
—	Fore- and hindwing fascia not pale lemon yellow, Madagascan species	***consobrinalis meloui*** (p. 417)
91 (89)	Sacculus process strongly upturned (Pl. 14, fig. 163) . .	***occidentalis*** (p. 411)
—	Sacculus process more or less straight	92
92 (91)	Median area in hindwing white. Genitalia as in Pl. 14, fig. 159 .	***ragonoti*** (p. 409)
—	Median area in hindwing not clear white	93
93 (92)	Cornutus short and broad (Pl. 16, fig. 171). Intense, conspicuous black post-median line in hindwing	***ruminalis*** (p. 415)
—	Cornutus long and pointed (Pl. 14, fig. 158). Wings variable in colour from black to pale straw yellow	***flammealis*** (p. 409)

TAXONOMIC SECTION WITH DESCRIPTIONS OF NEW SPECIES

The type locality of each species is given in brackets after the reference. All the specimens are in the British Museum (Natural History) unless otherwise stated.

THE *FLAMMEALIS* SPECIES GROUP

This consists of the next three species. The first two species are more closely related to one another than to the third.

1. *Endotricha flammealis* (Denis and Schiffermüller)

(Pl. 1, figs. 1 and 4, and Pl. 11, fig. 152)

Pyralis flammealis Denis and Schiffermüller, 1775 : 123 (Vienna District). The type of this species was destroyed with the rest of the Schiffermüller collection. (Horn and Kahle 1935–37 : 243.)

E. flammealis carnealis de Lattin, 1951 : 66 (Turkey). Type ♂ in Zoological Institute, Univ. of Saaland, Saabrucken, **syn. n.**

This is a widespread species in the Palaearctic region. The coloration of the wings is variable over the whole region. The genitalia are constant and there has been no apparent subspeciation over the whole of its range. Most of the other widely distributed species of the genus tend to form subspecies when spread over a wide area.

E. flammealis Denis and Schiff. *var. adustalis* Turati, 1905 : 48 (Sicily).

E. flammealis Denis and Schiff. *var. lutealis* Turati, 1905 : 48(Sicily).

We have the original series of both these varieties in the British Museum (ex. Ragusa coll.) The degree of variation within each series is large and I do not think that these variety names have any significance.

E. flammealis Denis and Schiff. *var. montanalis* Krulikovosky, 1907 : 32 (Caucasus). Type not traced (? in Kiev).

I have only examined a few specimens from the type locality but these do not differ from specimens from the rest of the range of *E. flammealis*.

Genitalia. ♂, Pl. 14, fig. 158. ♀, Pl. 29, fig. 252.

MATERIAL EXAMINED. ENGLAND AND WALES, 25 ♂, 18 ♀; SCILLY IS., 1 ♂; FRANCE, 9 ♂, 8 ♀; HUNGARY, 28 ♂, 20 ♀; SPAIN, 4 ♂, 1 ♀; PORTUGAL, 1 ♂, 2 ♀; CORSICA, 4 ♂; SARDINIA, 1 ♂; GERMANY, 5 ♂, 2 ♀; ITALY, 3 ♂, 3 ♀ (in Munich Museum). CAPRI, 1 ♂; CYPRUS, 4 ♂, 4 ♀; TURKEY, 10 ♂, 8 ♀ (8 ♂, 8 ♀ in coll. de Lattin); ASIA MINOR, 1 ♂; TRANSCAUCASIA, 4 ♂; CRIMEA, 2 ♂; LEBANON, 1 ♂; IRAN, 2 ♂ (in Amsel coll.); SYRIA, 9 ♂, 8 ♀; ALGERIA, 21 ♂, 17 ♀; TUNISIA, 7 ♂, 5 ♀.

2. *Endotricha ragonoti* Christoph

(Pl. 1, fig. 7)

E. ragonoti Christoph, 1893 : 96 (Turkestan). I designate as lectotype a ♂ labelled "Tian chan" (Turkestan) in Leningrad Museum.

E. albicinctalis Hampson, 1903 : 206 (North India). Holotype ♂ in B.M. **syn. n.**

I have not seen the lectotype but have examined material from the Leningrad Museum which had been compared with it by Dr. Kuznetzov. The genitalia of these specimens agree very closely with *E. albicinctalis* from N. India.

Genitalia. ♂, Pl. 14, fig. 159. ♀, Pl. 29, fig. 253.

MATERIAL EXAMINED. CENTRAL ASIA, 5 ♂, 2 ♀ (including 2 ♂, 2 ♀ in Munich Mus.) ; INDIAN SUBCONTINENT (North), 1 ♂.

3. *Endotricha consocia* (Butler)

(Pl. 1, figs. 2 and 5)

Doththa consocia Butler, 1879 : 452. (Japan.) Holotype ♀ in B.M.
E. albicilia Hampson ; Wileman *nec* Hampson, 1911 : 368.

The colour of the Japanese specimens varies from pale orange-red to a deep red-brown. Further examination of more material from widely separated localities may show that this species can be split into subspecies.

Genitalia. ♂, Pl. 14, fig. 160. ♀, Pl. 29, fig. 254.

MATERIAL EXAMINED. JAPAN, 2 ♂, 9 ♀ (including 5 ♀ in Inoue coll.) ; CHINA, 1 ♂, 2 ♀.

THE *THEONALIS* SPECIES GROUP

The next two species are closely related and can only be reliably separated on genitalia.

4. *Endotricha theonalis* (Walker)

(Pl. 1, figs. 3 and 6)

Pyralis theonalis Walker, 1859, 19 : 900. (Shanghai.) Holotype ♂ in B.M.
Pyralis thermusalis Walker, 1859, 19 : 912. (Shanghai.) Holotype ♀ in B.M.
Zania unicalis Walker, 1865, 34 : 1257. (Shanghai.) Holotype ♂ in B.M.
Endotrichodes perustalis Ragonot, 1891 : 522. (Shanghai.) Holotype ♂ in Paris Mus.
Endotricha hypogrammalis Hampson, 1906 : 209. (China.) Holotype ♂ in B.M. **syn. n.**
E. anpingia Strand, 1919 : 55. (Formosa.) Holotype ♀ in Deut. Ent. Inst., Berlin, **syn. n.**

The wing span of the Japanese specimens is larger than the Chinese ones (21 mm. for the former, 17 mm. for the latter) and there is some variation in the shape of the cornutus. Further material will probably show that the Japanese specimens represent a distinct subspecies.

Genitalia. ♂, Pl. 14, fig. 162. ♀, Pl. 29, fig. 256.

MATERIAL EXAMINED. CHINA, 6 ♂, 3 ♀ ; FORMOSA, 3 ♂, 3 ♀ ; JAPAN, 8 ♂, 1 ♀ (including 3 ♂ in Inoue coll.).

5. *Endotricha decessalis* Walker

This species is very variable in size and coloration. The nominate subspecies is smaller than the new subspecies from Sarawak. In contrast with *E. theonalis* this species has a pointed sacculus process on the valve of the male.

Endotricha decessalis decessalis Walker

(Pl. 1, figs. 8 and 11)

E. decessalis Walker, 1859, 17 : 390. (Ceylon.) Holotype ♀ in B.M.

The wing-span of this subspecies is 18 mm. compared with 22 mm. of the subspecies *major*.

Genitalia. ♂, Pl. 14, fig. 161. ♀, Pl. 29, fig. 255.

MATERIAL EXAMINED. CEYLON, 2 ♂, 3 ♀; BURMA, 2 ♂, 8 ♀; SEYCHELLES, 1 ♀.

Endotricha decessalis major subsp. n.

(Pl. 1, fig. 9)

♂. Wing 11 mm. Head grey, thorax grey-brown.

Forewing. Unicolorous orange-yellow irrorate with brown. Terminal area with a pinky suffusion.

Hindwing. Similar, median area yellower than margin. Margin with a pinky suffusion.

Underside. Forewings paler than upperside with smoky suffusion. Hindwings with clear ante- and post-median fascia.

♀. Darker than ♂. Median area on upperside of hindwings distinct. This subspecies is larger and a more orange yellow (instead of brown) than the nominate subspecies.

Genitalia. As nominate subspecies.

MATERIAL EXAMINED. Holotype ♂, SARAWAK, " Sarawak ", Brit. Mus. slide No. 4791, in B.M.

Paratypes. SARAWAK, 2 ♂ (data as type).

Other material. ANDAMAN IS., 2 ♀.

THE *OCCIDENTALIS* SPECIES GROUP

The next three species are Australian. They show some similarities in genitalia structure to the species in the two preceding groups. This group contains the only known Australian species which lack the reflexed costal hairs.

6. *Endotricha occidentalis* Hampson

(Pl. I, fig. 10)

E. occidentalis Hampson, 1916 : 361. (W. Australia.) Holotype ♂ in B.M.

This species is known only from the type specimen.

Genitalia. ♂, Pl. 14, fig. 163.

MATERIAL EXAMINED. AUSTRALIA, 1 ♂ (type).

7. *Endotricha hemicausta* Turner

(Pl. 1, fig. 12)

E. hemicausta Turner, 1904 : 184. (N. Australia.) Holotype ♂ in C.S.I.R.O., Canberra, Australia.

This species is known only from the type specimen.
Genitalia. ♂, Pl. 15, fig. 164.

MATERIAL EXAMINED. AUSTRALIA, 1 ♂ (in C.S.I.R.O. coll.).

8. *Endotricha melanochroa* Turner

(Pl. 1, fig. 13)

E. melanochroa Turner, 1911 : 121. (N. Australia.) Holotype ♀ in C.S.I.R.O., Canberra, Australia.
E. sareochroa Hampson, 1916 : 362. (W. Australia.) Holotype ♂ in B.M. **syn. n.**

This species is variable in colour. Specimens from W. Australia are a sandy colour whereas those from the north tend to be greyer.
Genitalia. ♂, Pl. 15, fig. 165. ♀, Pl. 29, fig. 257.

MATERIAL EXAMINED. AUSTRALIA, 2 ♂, 1 ♀ (♀ type in Canberra) ; BALI, 1 ♀.

THE *ICELUSALIS* SPECIES GROUP

The next four species have a forked cornutus in the aedeagus. The first three species are very similar externally and have often been confused. A yellow spot in the forewing separates *E. kuznetzovi* sp. n. from the other species in the group. The last species has similar genitalia to the rest of the group but is distinct externally.

9. *Endotricha kuznetzovi* sp. n.

(Pl. 2, figs. 16 and 19)

♂. Wing 8·5 mm. Head orange-brown. Thorax orange-brown with white scales scattered throughout.

Forewing. Fringe white, outer margin with thin interrupted black line along edge. Terminal area reddish brown. Two parallel slightly sinuous lines subterminally. Subterminal area reddish brown suffused with black. A bright yellow discal spot. Yellow median band edged with white, antemedial line black, incomplete anteriorly. Sub-basal and basal area brick red. Costal margin black interrupted by clear white marks.

Hindwing. No subterminal line. Median area white with yellow centre edged on outer and inner margin with black. Rest of wing red.

♀. Similar.

Genitalia. ♂, Pl. 15, fig. 166. ♀, Pl. 29, fig. 258.

MATERIAL EXAMINED. Holotype ♂, MANCHURIA, " Manchuria ", Brit. Mus. slide No. 4852, in B.M.

Paratypes. MANCHURIA, 2 ♂, " Sidemi, (Jackowski), 1882 " ; 4 ♂, " Moerschan, 100 km. (Charbin) " ; 1 ♂, " Hsioling Prov. (Kirin), 6.viii.39 " ; 1 ♂, " Yablonga, 23.vii.37 ", (all in Munich Museum) ; 2 ♂, (ex Paravicini coll).

EAST SIBERIA, 1 ♂, 1 ♀, " Amur, coll. Kalchberg ", (in Nat. Hist. Mus., Vienna) ; 2 ♂, 2 ♀, " Narva, S. Ussuri " ; 1 ♂, 1 ♀, " Amur " ; 1 ♂, " Ussuri, Chabarovosk, 1910, (Borsow) " ; 3 ♂, 2 ♀, " Askold ".

KOREA, 1 ♂, " Ori Dong, iv.53, (Thompson) "; 1 ♂, 1 ♀, " Gensan, 1887, (Leech) ".

Other material. JAPAN, 2 ♂, 1 ♀, " Chigasaki, 23.viii.56, (Inoue) ", (in coll. Inoue).

It is possible that the Japanese specimens represent a new subspecies. The number of " arms " of the cornutus is larger than in any other specimens examined. This species is related to *E. flavofascialis* Bremer.

10. *Endotricha flavofascialis* (Bremer)

The hooked sacculus process of the male of this species separates it from all other species in this group.

Endotricha flavofascialis flavofascialis (Bremer)

Rhodaria flavofascialis Bremer, 1864 : 65. (East Siberia.) Holotype ♀ in Leningrad Museum.
E. icelusalis Walker ; Hampson *nec* Walker, 1896*b* : 484.

The moth is not figured, all the specimens examined were too poor to photograph. This subspecies differs from subspecies *affinialis* (Pl. 2, fig. 24) in the presence of a clearly defined yellow band in the forewing of the nominate subspecies.

Genitalia. ♂, Pl. 15, fig. 167. ♀, Pl. 30, fig. 259.

MATERIAL EXAMINED. EAST SIBERIA, 2 ♂, 1 ♀.

Endotricha flavofascialis affinialis South. **stat. n.**

(Pl. 2, fig. 24)

E. affinialis South, 1901 : 418. (Japan.) Holotype ♂ in B.M.
Scenedra affinialis South ; Inoue, 1955 : 147.

The median area of the forewing which is clearly defined in the nominate subspecies has almost disappeared in this subspecies. There is also a slight difference in the shape of the valve process which is more strongly upturned than in the nominate subspecies.

Genitalia. As nominate subspecies.

MATERIAL EXAMINED. JAPAN, 4 ♂.

11. *Endotricha icelusalis* (Walker)

(Pl. 2, figs. 17 and 20)

Pyralis icelusalis Walker, 1859, 19 : 900. (North China.) Holotype ♀ in B.M.
Pyralis rosealis Walker, 1865, 34 : 1236. (North China.) Holotype ♂ in B.M.
Endotricha icelusalis Walker form *rosealis* Walker, *auct.*
E. icalusalis Walker ; Caradja and Meyrick, 1936 : 149 (mis-spelling).
E. icelusalis var *rosealis* Walker ; Caradja, 1932 : 121.

There is considerable variation in the brick-red ground colour of this species. This species varies in size and is generally larger than *E. flavofascialis* which it

externally resembles, (*icelusalis*, wing, 9 mm. ; *flavofascialis*, wing, 8 mm.). The lack of the yellow discal spot separates this species from *kuznetzovi* and the straight subterminal line on the forewing separates it from *flavofascialis*.

Genitalia. ♂, Pl. 15, fig. 168. ♀, Pl. 30, fig. 260. Curious pores are visible in the bursa copulatrix near the signum in the female. I have not seen them in any other species, their position does not appear to be constant.

MATERIAL EXAMINED. CHINA, 5 ♂, 11 ♀; JAPAN, 5 ♂, 3 ♀ (including 1 ♂ in Canadian National coll.).

12. *Endotricha trichophoralis* Hampson

(Pl. 1, fig. 14)

E. trichophoralis Hampson, 1906 : 209. (Singapore.) Holotype ♂ in B.M.

This species is only known from the damaged type and a single female specimen, which lacks an abdomen.

Genitalia. ♂, Pl. 15, fig. 169.

MATERIAL EXAMINED. MALAYA, 1 ♂; BORNEO, 1 ♀.

THE *LUTEOGRISALIS* SPECIES GROUP

The next nine species show some features in common, particularly the tendency for a reduction in the size of the cornutus in the aedeagus, which may even be absent. There is also a general similarity in pattern between the species in this group. The group is not a natural one, the similarities probably being due to convergence.

13. *Endotricha luteogrisalis* Hampson

(Pl. 2, fig. 23)

E. luteogrisalis Hampson, 1896*a* : 136. (Bhutan.) Holotype ♂ in B.M.

Genitalia. ♂, Pl. 16, fig. 170.

MATERIAL EXAMINED. INDIAN SUBCONTINENT (North), 2 ♂.

14. *Endotricha punicea* sp. n.

(Pl. 1, fig. 15)

♂. Wing 8 mm. Head brown tinged with pink. Thorax with prominent tegulae of yellowish scales suffused with pink. Abdomen, yellow dorsally, suffused with pink, pink laterally. Coremata yellowish.

Forewing. Pinky red with broad yellow band. Apical $\frac{1}{3}$ of fringe yellow with brown base, rest pink with yellow tips. Dark brown terminal line, continuous. Terminal area deep rose pink. Subterminal line irregularly sinuous. Broad subterminal band pink suffused with black scales. Black discal spot. Median band bright yellow. Sub-basal and basal areas pinky red suffused with black.

Hindwing. Fringe pink, dark line through centre, white tipped. Terminal area brown, narrow. Colour and pattern as forewing.

Underside. Forewings mostly pink suffused with black. Yellow patch on anterior $\frac{1}{3}$ of median area.

♀. Similar.

Genitalia. ♂, Pl. 18, fig. 186. ♀ Pl. 30, fig. 262.

This species resembles *E. flavifusalis* Warr., but the genitalia are distinct.

MATERIAL EXAMINED. Holotype ♂, TIBET, " Tay-Tou-Ho, Chasseurs Thibetain, 1896 ", Brit. Mus. slide No. 4594, in B.M.

Paratypes. TIBET, 3 ♂, 6 ♀, (data as type).

15. *Endotricha ruminalis* (Walker)

(Pl. 2, fig. 27)

Agrotera ruminalis Walker, 1859, 17 : 387. (North Hindustan.) Holotype ♂ in B.M.
Endotricha ruminalis Walker ; Hampson, 1896*b* : 484.
Pyralis ibycusalis Walker, 1859, 19 : 899. (N. India.) Holotype ♀ in University Museum, Oxford.
Endotricha symphonialis Hampson, 1893 : 161. (Ceylon.) Holotype ♀ in B.M.

This species is variable in colour over its whole geographic range but the genitalia are constant. Hampson gives Burma and East Pegu as localities for this species (1896*a* : 135 and 1896*b* : 484) but I have not seen these specimens.

Genitalia. ♂, Pl. 16, fig. 171. ♀, Pl. 30, fig. 261.

MATERIAL EXAMINED. INDIAN SUBCONTINENT (North), 3 ♀ ; CEYLON, 1 ♂, 10 ♀ ; MALAYA, 4 ♀.

16. *Endotricha loricata* Moore

(Pl. 2, figs. 18 and 21)

E. loricata Moore, 1888 : 206. (Pakistan.) Holotype ♀ in B.M.
Pyralis ustalis Hampson, 1893 : 159. (Ceylon.) Holotype ♀ in B.M.

This species is similar externally to *E. affinitalis* Hering and the two species may be subspecifically related.

Genitalia. ♂, Pl. 16, fig. 172. ♀, Pl. 30, fig. 263.

MATERIAL EXAMINED. CEYLON, 1 ♂, 4 ♀ ; PAKISTAN, 1 ♀.

17. *Endotricha affinitalis* Hering

(Pl. 2, fig. 26)

E. affinitalis Hering, 1901 : 45. (Sumatra.) Lectotype selected, labelled " 1889, Sumatra Ieli, Sta.", in Warsaw Museum, Poland.

This species is known only from the lectotype, the remaining specimens having been lost. There are slight differences between this species and *E. loricata* Moore

Genitalia. ♀, Pl. 30, fig. 264.

MATERIAL EXAMINED. SUMATRA, 1 ♀ (in Warsaw Museum coll.).

18. *Endotricha puncticostalis* (Walker)

(Pl. 2, figs. 22 and 25)

Rhisina puncticostalis Walker, 1865, 34 : 1324. (Australia.) Holotype ♂ in B.M.
Endotricha ustalis Snellen, 1880 : 201. (Celebes.) Lectotype ♂ in Leiden, Holland.
Pyralis listeri Butler, 1888 : 546. (Christmas Is.) Holotype ♀ in B.M. **syn. n.**
Endotricha listeri Butler ; Butler *nec* Hampson, 1900 ; Zoological Record, 1900 : 278.

This species is very similar externally to " *Endotricha* " *compsopa* Meyrick (p. 447) but the genitalia are distinct. The specimens of *E. listeri* from Christmas Is. are slightly smaller than the Australian specimens but there is some overlap in size. I am not certain if the specimens from the Philippines, Java and Sumba are conspecific. Further material is needed.

Genitalia. ♂, Pl. 18, fig. 183. ♀, Pl. 28, fig. 250, the female is unique in the genus *Endotricha* in lacking a signum on the bursa.

MATERIAL EXAMINED. AUSTRALIA, 6 ♂, 9 ♀; SALAYER, 1 ♂; CHRISTMAS IS. (Indian Ocean), 6 ♂, 30 ♀. (Philippines 5 ♀, Sumba 1 ♀, Java 1 ♀.)

19. *Endotricha wilemani* West

(Pl. 2, fig. 28)

E. wilemani West, 1931 : 212. (Philippines.) Holotype ♀ in B.M.

I have only seen females of this species and am uncertain of their affinities.

Genitalia. ♀ Pl. 30, fig. 265.

MATERIAL EXAMINED. PHILIPPINES, 2 ♀.

20. *Endotricha consobrinalis* Zeller

This species is widespread over Africa. It is very variable in size and coloration and may be split into new subspecies when more material is available. The W. African specimens tend to be smaller than specimens from the rest of Africa and to have a smaller cornutus. The type of *E. jordana* Hampson, formerly in the Berlin Museum, was destroyed in the war (H. Hannemann, in litt.). I have only seen one ♂ from the type locality but this agrees very closely with *consobrinalis* Zeller. There is a tendency in this species to produce very dark forms over the equatorial part of its range, these may be seasonal forms. The Madagascan subspecies can be distinguished from the nominate subspecies by the larger and more strongly sclerotised cornutus of the former.

Endotricha consobrinalis consobrinalis Zeller

(Pl. 3, figs. 31, 32 and 34)

E. consobrinalis Zeller, 1852 : 24. (S. Africa.) Holotype ♂ in Natural History Museum, Stockholm.
Pyralis dissimulans Warren, 1897 : 126. (S. Africa.) Holotype ♂ in B.M.
Endotricha brunnea Warren, 1897 : 129. (S. Africa.) Holotype ♂ in B.M.
E. jordana Hampson, 1900 : 377. (Jordan.) Lectotype ♂ selected labelled " Jordan " in Berlin Museum, **syn. n.**

Genitalia. ♂, Pl. 18, fig. 182. ♀, Pl. 28, fig. 249.

MATERIAL EXAMINED. S. AFRICA, 3 ♂, 15 ♀, (including 3 ♀ in Transvaal Mus. Coll.) ; E. AFRICA, Kenya, 1 ♂, 3 ♀; Tanganyika, 5 ♀ (in Munich Mus. coll.) ; EGYPT, 4 ♂, 2 ♀; SUDAN, 2 ♀; W. AFRICA, Ghana, 1 ♂, 1 ♀; PALESTINE, 4 ♀ (1 ♀ in Berlin Mus. coll.) ; JORDAN, 1 ♂, 5 ♀ (1 ♂ and 3 ♀ in Berlin Mus. coll., 2 ♀ in Amsel coll.).

Endotricha consobrinalis meloui **subsp. n.**

(Pl. 3, fig. 33)

Externally similar to the nominate subspecies and showing the same high degree of variability. It can be distinguished from the nominate subspecies by its larger and more strongly chitinised cornutus.

Genitalia. As nominate subspecies, but with a more strongly chitinised cornutus in the ♂.

MATERIAL EXAMINED. Holotype ♂, MADAGASCAR, " Nanisa, near Tananarivo, December 1931, Olsoufieff, Pyralidae, Brit. Mus. slide No. 4703 ", in B.M.

Paratypes. MADAGASCAR, 5 ♂, 9 ♀.

21. ***Endotricha rogenhoferi*** Rebel

(Pl. 2, fig. 29)

E. rogenhoferi Rebel, 1892 : 249. (Canary Is.) Lectotype ♂ selected, labelled " Palma, Simony, 1889, Rebel, 26.iii.90, Litt. no. 18," in B.M.

This species is rather like pale specimens of *E. flammealis* Schiff. The male of *E. rogenhoferi* has well developed reflexed hairs on the costa of the valve which is not shown by any other Palaearctic species. I think that this species was probably derived from an African one, perhaps *E. consobrinalis* Zell. The female of *E. rogenhoferi* is unknown.

Genitalia. ♂, Pl. 18, fig. 187.

MATERIAL EXAMINED. CANARY IS., 2 ♂, (including 1 ♂ in Nat. History Museum, Vienna).

The *ELLISONI* Species Group

Several features in the genitalia (e.g. spined base to the sacculus process) suggest that the first three species of this group are closely related although they differ externally.

22. *Endotricha ellisoni* sp. n.

(Pl. 3, figs. 35 and 38)

♂. Wing 9 mm. Head, thorax and abdomen yellowish brown.

Forewing. Fringe yellowish, mauve at the base. Terminal line black, continuous. Terminal area reddish purple. Subterminal line indistinct, sinuous, white. Subterminal area reddish brown, irrorate with brown scales. Median area yellow, lightly suffused with brown scales, clearly demarcated on antemedial side, indistinctly so on postmedial side. Basal and subbasal areas brown. Costal margin black with small yellowish-white dots along length.

Hindwing. Similar. Subterminal area more reddish. Medial area clearly defined on each side.

Underside. Similar. Yellowish patch near apex of forewing, along the costa and $\frac{1}{4}$ across wing.

♀. Grey brown, heavily suffused with dark brown scales. Terminal area pinkish, rest of wing unmarked. Hindwings similar, ante- and postmedial lines faintly visible.

Genitalia. ♂, Pl. 16, fig. 173. ♀, Pl. 31, fig. 267.

This is a very variable species, both in size and coloration and will probably be split into subspecies when more material is available. Specimens from Kenya and Uganda are smaller, brighter red, and lack the distinct median area of the Abyssinian specimens. Specimens from S. Africa may also be subspecifically distinct. A single specimen from the Congo (in Tervuren coll.) has a cornutus of a slightly different shape and is only doubtfully referred here, otherwise the genitalia show little variation over the whole range.

Material examined. Holotype ♂, Abyssinia, " Harar, 8.iv.39 (Ellison) ", Brit. Mus. slide No. 4830, in B.M.

Paratypes. Abyssinia, 2 ♂, (data as type), 1 ♀, " Harar, 13.xii.37 ".

Other material. East Africa, Uganda, 3 ♂; Kenya, 1 ♂; Congo, 1 ♂ (in Canadian Nat. Coll.); 1 ♂, (in Tervuren Mus.); South Africa, 4 ♂, 7 ♀, (all in Transvaal Museum).

23. *Endotricha niveifimbrialis* Hampson

(Pl. 3, fig. 41)

E. niveifimbrialis Hampson, 1906 : 211. (Sierra Leone.) Holotype ♀ in B.M.

Genitalia. ♂, Pl. 18, fig. 184. ♀, Pl. 28, fig. 251.

Material examined. Sierra Leone, 1 ♂, 1 ♀ : Cameroons, 2 ♂.

24. *Endotricha rosina* Ghesquière

(Pl. 3, figs. 39 and 42)

E. rosina Ghesquière, 1942 : 228. (Congo.) Holotype ♀ in Tervuren, Belgium.

I am uncertain of the relationship of this species. I have examined the type but have been unable to find any other specimens to match it. Tentatively I am identifying two males from the Congo as this species, if this is correct then the species is related to *E. ellisoni* Whalley.

Genitalia. ♂, Pl. 16, fig. 174. ♀, Pl. 31, fig. 266.

MATERIAL EXAMINED. CONGO, 2 ♂, 1 ♀ (all in Tervuren).

25. *Endotricha vinolentalis* Ragonot

(Pl. 3, fig. 43)

E. vinolentalis Ragonot, 1891 : 525. (W. Africa.) Holotype ♀ in Paris Mus.

This species is very variable in colour. The males tend to have varying amounts of yellow ochre on the forewings and a distinct yellow ochre median area in the hind wings.

Genitalia. ♂, Pl. 16, fig. 175. ♀, Pl. 31, fig. 268.

MATERIAL EXAMINED. W. AFRICA ; Ivory Coast, 20 ♂, 30 ♀ ; Gambia, 4 ♂, 2 ♀ ; Cameroons, 1 ♀ ; Sierra Leone, 1 ♂ ; Ghana, 1 ♀. E. AFRICA ; Kenya, 1 ♂ (in Coryndon Mus. coll., Nairobi).

THE *ERYTHRALIS* SPECIES GROUP

The relationship of the species in this group is very interesting. The first four species are only known from the W. African island of São Thomé, whereas the last is a cosmopolitan African species. The first four have identical genitalia although they are very different in external appearance. These four are probably derived from the widespread African species.

26. *Endotricha tamsi* sp. n.

(Pl. 4, fig. 52)

♂. Wing 9·5 mm. Head, thorax, light brown irrorate with darker brown scales. Tegulae brown, with white scales.

Forewing. Chocolate brown with a prominent white patch near inner edge of hind margin of forewing. Fringe with apical third light, remainder brown with dark line through centre. Costa black with small whitish spots, the sub-apical one enlarged and continued as subterminal fascia. Terminal line black, slightly thickened between ends of each vein. Terminal area chocolate brown. Subterminal fascia pale, weakly sinuate. Median area chocolate brown, discal spot comma-shaped. Median line white, incomplete anteriorly, posteriorly enlarged to white patch with white mark pointing towards terminal margin. Rest of wing chocolate brown.

Hindwing. Fringe white, brown band running through, base narrowly white. Outer half of wing chocolate brown, becoming obscure towards hind margin. Rest of wing yellowish brown, orange in basal area.

Underside. Forewings grey brown with a reddish tinge. Hindwings similar. ♀ unknown.

Genitalia. ♂ similar to those of *E. altitudinalis* (Viette), Pl. 17, fig. 176.

MATERIAL EXAMINED. Holotype ♂, WEST AFRICA, "São Thomé, 2.xi.32" in B.M.

Paratypes. WEST AFRICA, 6 ♂, 1 ♀, (data as type).

27. *Endotricha viettealis* nom. n.

(Pl. 4, figs. 47 and 50)

Anobostra rosealis Viette, 1957 : 93. (São Thomé.) Holotype ♂ in Paris Mus.
Junior homonym of *E. rosealis* Walker, 1865.
Endotricha viettealis **nom. n.** for *E. rosealis* (Viette) **comb. n.**

There is some variation in the coloration of this species, but externally it is quite different from all other species of *Endotricha*.

Genitalia. ♂ and ♀ similar to those of *E. altitudinalis* (Viette), Pl. 17, fig. 176 and Pl. 31, fig. 270.

MATERIAL EXAMINED. W. AFRICA ; São Thomé, 16 ♂, 23 ♀ (including 1 ♂ and 1 ♀ in Paris Mus.).

28. *Endotricha thomealis* (Viette) comb. n.

(Pl. 4, figs. 48 and 51)

Anobostra thomealis Viette, 1957 : 92. (São Thomé.) Holotype ♂ in Paris Mus.

Genitalia. ♂ similar to those of *E. altitudinalis* (Viette), Pl. 17, fig. 176, ♀, Pl. 31, fig. 269.

MATERIAL EXAMINED. W. AFRICA ; São Thomé, 16 ♂, 23 ♀ (including 1 ♂ and 1 ♀ in Paris Mus.).

29. *Endotricha altitudinalis* (Viette) comb. n.

(Pl. 4, fig. 53)

Anobostra altitudinalis Viette, 1957 : 92. (São Thomé.) Holotype ♂ in Paris Mus.

Genitalia. ♂, Pl. 17, fig. 176. ♀, Pl. 31, fig. 270.

MATERIAL EXAMINED. W. AFRICA ; São Thomé, 4 ♂, 8 ♀ (including 1 ♂ and 3 ♀ in Paris Mus.).

30. *Endotricha erythralis* Mabille

(Pl. 4, figs. 46 and 49)

E. erythralis Mabille, 1900 : 742. (Madagascar.) Holotype ♀ in Paris Mus.
E. rosellita Ghesquière, 1942 : 228. (Congo.) Holotype ♀ in Tervuren, Belgium, **syn. n.**

This is a very variable species and will probably be split into subspecies when longer series are available. There is some variation in the size of the cornutus. The single specimen from Socotra may well represent a new subspecies, the typical reddish ground colour being replaced by a grey colour in this specimen.

Genitalia. ♂, Pl. 17, fig. 177. ♀, Pl. 31, fig. 271.

MATERIAL EXAMINED. MADAGASCAR, 13 ♂, 6 ♀; S. AFRICA, 5 ♂, 5 ♀ (all in Transvaal Mus.); CONGO, 2 ♂, 4 ♀ (all in Tervuren); SOCOTRA 1 ♂.

THE *MURECINALIS* SPECIES GROUP

The next four species are grouped together for convenience. They all possess certain individual peculiarities.

31. *Endotricha murecinalis* Hampson

(Pl. 3, fig. 44)

E. murecinalis Hampson, 1916 : 361. (New Guinea.) Holotype ♂ in B.M.

Genitalia. ♂, Pl. 17, fig. 178. ♀ unknown.

MATERIAL EXAMINED. NEW GUINEA, 1 ♂; DOREY IS. 1 ♂.

32. *Endotricha gregalis* Pagenstecher

(Pl. 3, fig. 45)

E. gregalis Pagenstecher, 1900 : 168. (New Britain.) Holotype ♂ in B.M.

This species is known only from the type.

Genitalia. ♂, Pl. 17, fig. 179

MATERIAL EXAMINED. NEW BRITAIN, 1 ♂.

33. *Endotricha portialis* Walker

(Pl. 4, fig. 54 and Pl. 11, fig. 153)

E. portialis Walker, 1859, 19 : 391. (Sarawak.) Holotype ♀ in B.M.
Doththa aecusalis Walker, 1859, 19 : 921. (Sarawak.) Holotype ♂ in University Museum, Oxford.
Endotrichopsis rhodopteralis Warren, 1895 : 467. (Japan.) Holotype ♂ in B.M.
Endotricha acrobasalis Snellen, 1892 : 155. (Java.) Holotype ♂ in Leiden, Holland.

This species is very constant in colour. The labial palps are very long and extend above the crown of the head (Pl. 11, fig. 153), a feature not shown by any other known species of *Endotricha*.

Genitalia. ♂, Pl. 17, fig. 180. ♀, Pl. 32, fig. 273.

MATERIAL EXAMINED. BORNEO, 2 ♂, 2 ♀; BALI, 2 ♂; JAPAN, 10 ♂, 2 ♀ (including 2 ♂ in Canadian Nat. coll., and 2 ♂ in Inoue coll.); JAVA, 1 ♂; SUMATRA, 1 ♂.

34. *Endotricha ignealis* Guenée

(Pl. 4, figs. 55 and 58)

E. ignealis Guenée, 1854 : 220. (Australia.) Holotype ♀ in B.M.
Pyralis docilisalis Walker, 1859, 19 : 913. (Australia.) Holotype ♀ in B.M., **syn. n.**
Endotricha aethopa Meyrick, 1884 : 79. (Australia.) Lectotype ♂ selected from Meyrick coll., labelled "Sydney, N.S. Wales, 12.9.81, Pyralidae Brit. Mus. slide no. 4492", in B.M., **syn. n.**

This species is unusual in the genus *Endotricha* in that vein R_3 arises before vein R_5 on the common stalk of $R_3 + R_4 + R_5$. All other known species of the genus have R_3 arising after R_5 on the common stem.

Genitalia. ♂, Pl. 17, fig. 181. ♀, Pl. 32, fig. 272.

MATERIAL EXAMINED. AUSTRALIA, 3 ♂, 3 ♀.

THE *MESENTERIALIS* SPECIES GROUP

The next six species form a very compact group. They all show certain features which are not found in other members of the genus. The enlarged basal segment of the antennae (fig. 155) and the basal process on the valve are peculiar to this group. Only one other species possesses the basal process (*E. melanobasis* Hampson) and this lacks the other features of the *mesenterialis* species group.

35. *Endotricha olivacealis* (Bremer)

(Pl. 4, figs. 56, 57, 59 and 60, and Pl. 11, fig. 154)

Rhodaria olivacealis Bremer, 1864 : 66. (E. Siberia.) Holotype ♀ in Leningrad Mus.
Endotricha flavifimbrialis Warren, 1891 : 69. (N. India.) Holotype ♂ in B.M. **syn. n.**
E. mesenterialis Walker, *partim*, *auct.*

I have not seen the type of this species but have a series from the type locality and a specimen which has been compared with the type by Dr. Kuznetzov. This is a very variable species both in size and coloration. The cornutus of the Indian specimens varies in size but is generally slightly larger than in the Manchurian specimens. This species will probably be split into new subspecies when more material is studied. *E. olivacealis* has long been confused with *E. mesenterialis* Walker, with which it has many similarities. The shape of the basal segment of the antennae affords the simplest means of separating these two species (Pl. 11, figs 154 and 155).

This species occurs with the very similar *E. mesenterialis* only in the Anamali Hills in India, otherwise the two species are geographically separated.

Genitalia. ♂, Pl. 19, fig. 191. ♀, Pl. 32, fig. 274.

MATERIAL EXAMINED. EAST SIBERIA, 11 ♂, 3 ♀; KOREA, 2 ♂, 1 ♀; FORMOSA, 4 ♂, 2 ♀; JAPAN, 4 ♂, 2 ♀ (including 3 ♂ and 2 ♀ in Inoue coll.); CHINA, 13 ♂, 9 ♀ (including 7 ♂ and 7 ♀ in Munich Mus. coll., and 2 ♂ and 2 ♀ in Amsel coll.); INDIAN SUBCONTINENT (North) 11 ♂, 3 ♀; (South) 3 ♂; BURMA, 1 ♂; WEST JAVA, 2 ♂, (both in Canadian Nat. coll.).

36. *Endotricha mesenterialis* Walker

This is a widespread species which is variable both in size and coloration.

In Samoa, Loyalty Is. and New Hebrides this species occurs alongside *E. plinthopa* and *E. propinqua*, which it closely resembles. It is probable that the islands mentioned were subject to two "invasions" of *mesenterialis* at different times. The first invasion had evidently differentiated sufficiently from the parent stock not to interbreed when the second invasion took place.

Endotricha mesenterialis mesenterialis (Walker)

(Pl. 5, figs. 61 and 64, and Pl. 11, fig. 155)

Doththa mesenterialis Walker, 1859, 17 : 285. (Sarawak.) Holotype ♂ in B.M.
Endotricha suffusalis Walker, 1859, 17 : 390. (Ceylon.) Holotype ♀ in B.M.
E. eoidalis Snellen 1895 : 112. (W. Java.) Lectotype ♂ in Leiden, Holland.
E. flavifusalis Warren ; Hampson *nec* Warren, 1896*b* : 483.
(*non*) *D. mesenterialis* Var., Walker, 1859, 19 : 920 (See *E. borneoensis*, p. 431). This subspecies varies in size but does not exceed 18·5 mm. wingspan.

Genitalia. ♂, Pl. 19, fig. 190. ♀, Pl. 32, fig. 276.

MATERIAL EXAMINED. BORNEO, 3 ♂; INDIAN SUBCONTINENT, 3 ♂, 2 ♀ (including 2 ♂ and 2 ♀ in Canadian Nat. coll.); CEYLON, 12 ♂, 12 ♀; MALAYA, 5 ♂, 1 ♀; NICOBAR IS., 1 ♂; SELAYER IS., 1 ♂; CHRISTMAS IS., (Indian ocean), 1 ♂; ST. MATTIAS IS., 1 ♂; BEGUM IS., 1 ♂; TONGA, 1 ♂; LOUISIADE ARCHIPELAGO, 1 ♂; NEW HEBRIDES, 5 ♂, 3 ♀.

Endotricha mesenterialis mahensis **nom. n., stat. n.**

(Pl. 5, figs. 63 and 66)

Endotricha flavofascialis Fryer, 1912 : 24. (Seychelles.) Holotype ♂ in B.M., junior homonym of *E. flavofascialis* Bremer, 1864 : 65.
E. mahensis **nom. n.** for *E. flavofascialis* Fryer, 1912.

In this subspecies the median area of the fore- and hindwing of the male are white, with a more grey colour in the wing than the nominate subspecies. The female of this subspecies is a very pale straw colour.

Genitalia. As nominate subspecies (Pl. 19, fig. 190 and Pl. 32, fig. 276).

MATERIAL EXAMINED. SEYCHELLES, 4 ♂, 5 ♀.

Endotricha mesenterialis obscura Butler **stat. n.**

(Pl. 5, figs. 62 and 65)

E. obscura Butler, 1886 : 427. (Australia.) Holotype ♀ in B.M.

The spines in the aedeagus are slightly larger in this subspecies than in the nominate one. The males of this subspecies are larger than the nominate race (18·5 mm. wingspan or over). The division between *obscura* and the nominate subspecies is small and there may be some overlap.

Genitalia. As nominate subspecies (Pl. 19, fig. 190 and Pl. 32, fig. 276).

MATERIAL EXAMINED. AUSTRALIA, 23 ♂, 6 ♀; NEW GUINEA, 2 ♂, 1 ♀ (1 ♀ in Canadian Nat. coll.); SAMOA, 1 ♂, 1 ♀; TAHITI, 3 ♂, 3 ♀; AUSTRAL IS., 1 ♂, 1 ♀; FIJI, 1 ♂, 2 ♀; NEW CALEDONIA, 2 ♂; KERMADEC IS., 1 ♂, 1 ♀; PALAU IS., 4 ♂, 1 ♀ (in U.S. Nat. Mus.).

37. *Endotricha propinqua* **sp. n.**

(Pl. 5, figs. 67 and 70)

♂. Wing 11·5 mm. Head, thorax and abdomen dark reddish brown. Tegulae with whitish scale.

Forewing. Fringe white. Costal margin yellow. Terminal margin narrowly black. Terminal area purplish red. Subterminal fascia white, thin. Subterminal area bright reddish purple. Median area broadly white. Basal and sub-basal areas purplish brown.

Hindwing. Similar. Terminal band of purplish red extending to posterior margin.

Underside. Paler. White median band of forewing obscure. Basal area brown. White patch on hind margin. Hindwing with prominent double red sinuous postmedial line. Posterior two-thirds of median wing area white, anterior third brown. Basal and sub-basal area brown.

♀. Variable in colour. Median wing area not white, often obscure. Forewing may be dull purplish red, heavily marked, to bright orange, almost unmarked.

Genitalia. ♂, Pl. 19, fig. 195. ♀, Pl. 32, fig. 275.

The shape of the sacculus process (Pl. 19, fig. 195) of this species is slightly different from that of *E. plinthopa* Meyer. This species occurs in the same localities as *E. mesenterialis obscura* Butl., which it closely resembles, differing in size and, in the male, in the shape of the juxta.

MATERIAL EXAMINED. Holotype ♂, NEW HEBRIDES, "Redcrest, Aneityum, 3 ml. N.E. Anelgauhat, 1200 ft., 1955 (Cheesman)", Brit. Mus. slide No. 4886, in B.M.

Paratypes. NEW HEBRIDES, 7 ♂, 5 ♀, (data as type); 3 ♂, 3 ♀, "Erromanga, 1930 (Cheesman)"; LOYALTY IS., 2 ♂, 1 ♀, "E. Lifu, Cap des Pins, 1950 (Cheesman)"; NEW CALEDONIA, 1 ♀, "Tinchialit, 1949 (Cheesman)".

38. *Endotricha plinthopa* Meyrick

(Pl. 5, figs. 68 and 71)

E. plinthopa Meyrick, 1886 : 214. (Samoa.) Holotype ♀ in B.M.

Genitalia. ♂, Pl. 19, fig. 192. ♀, Pl. 32, fig. 277.

MATERIAL EXAMINED. SAMOA, 3 ♂, 6 ♀.

39. *Endotricha sexpunctata* sp. n.

(Pl. 5, fig. 74)

♂. Wing 8 mm. Head white. Antenna strongly bipectinate, prominent process on first segment as in Pl. 11, fig. 155. Thorax brown.

Forewing. General colour brown with two large hyaline areas on each fore- and hindwing. Costal margin brown, interrupted with yellowish brown patches. Apical hyaline area oval with narrow hyaline streak leading to near apex of costa. Posterior hyaline area rectangular. Rest of wings brown.

Hindwing. Brown, large oval hyaline medial area.

Underside, forewings. Brown, prominent line of large yellow brown scales along veins Cu_{1a} and Cu_{1b}. Apical hyaline area absent, posterior reduced. Underside, hindwings: as upperside hindwings.

♀. Unknown.

Genitalia. ♂, Pl. 18, fig. 188.

This species has similar genitalia to *E. argentata*, but is easily separated from this species by the large hyaline areas in the wings of *E. sexpunctata*.

MATERIAL EXAMINED. Holotype ♂, MARIANAS IS., " Guam (Fulloway coll.) " in U.S. Nat. Mus. Paratype, MARIANAS IS., 1 ♂, (data as type), in U.S. Nat. Mus.

40. *Endotricha argentata* sp. n.

(Pl. 5, figs. 69, 72 and 75)

♂. Wing 8·2 mm. Head whitish, antenna strongly bipectinate, basal joint enlarged, (Pl. 11, fig. 155). Thorax and tegulae white intermixed with grey scales.

Forewing. General colour silvery grey. Costal margin yellow and white alternate patches. Tips of fringe white, base white and black alternately. Subterminal line yellowish white, sinuous. Antemedial line faintly visible edged with black scales. Base of forewings grey, heavily suffused with white scales. Terminal and medial area white with a few grey scales intermixed.

Hindwing. Area anterior to Cu_{1b} grey. Posterior margin as far as $2A$ black with a few red scales near tornus. Rest of wing between Cu_{1a} and $2A$ white. Ante- and post-medial fascia lightly demarcated with black scales.

Underside. Forewing: greyish brown, prominent line of long yellow scales along Cu_{1b}. Some large raised scales over base of cell. Hindwing, anterior margin with yellowish scales, area anterior to M_1 grey. Dark patches of scales over marginal part of Cu_2 and $2A$. Wing crossed by two zig-zag dark lines from $\frac{1}{3}$ distance from apex to near tornus. A few reddish scales along Sc, R, Rs, and M_1

♀ 1. Forewing. Costa yellow and black alternate patches. Fringe white, base of fringe black. Terminal line interrupted blackish. Subterminal line sinuous yellowish white. Median area yellowish, rest of wing reddish brown, irrorate with black.

Hind wing. Similar, paler. Underside silvery grey, irrorated with black.

♀ 2. Forewing. No median band. General colour orange brown, reddish purple in terminal area.

Hindwings. Similar, paler, irrorated with red.

These two forms of the female of this species are the extremes. Intermediates occur where the median area is just demarcated.

Genitalia. ♂, Pl. 18, fig. 189. ♀, Pl. 33, fig. 280.

This species has the typical genitalia and morphology of the *mesenterialis* species group but the silvery grey colour of the male is not found in any other known species of *Endotricha*.

MATERIAL EXAMINED. Holotype ♂, MARIANAS Is., " Rota-Rota, 23.vi.46, (Townes), at light ", in U.S. National Museum.

Paratypes. MARIANAS Is., 2 ♂, 11 ♀, (data as type) ; 1 ♂, " Saipan, v.45 " ; 3 ♀, " Saipan, x.47 ", (all in U.S. Nat. Mus. Coll.).

THE *COSTAEMACULALIS* SPECIES GROUP

This consists of the next seven species. They have a basically similar genitalia pattern with a " T "-shaped uncus. Two species are known from the ♀ only (*ardentalis* Hampson and *sondaicalis* Snellen) but they are probably related to other species in this group.

41. ***Endotricha suavalis*** Snellen

(Pl. 5, fig. 73)

E. suavalis Snellen, 1895 : 113. (Java.) Holotype ♂ in Leiden, Holland.

Only the male of this species is known.

Genitalia. ♂, Pl. 20, fig. 198.

MATERIAL EXAMINED. 5 ♂ (including 1 ♂ in Leiden and 3 ♂ in Warsaw).

42. ***Endotricha similata*** (Moore)

(Pl. 3, figs. 37 and 40)

Doththa similata Moore, 1888 : 206. (N. India.) Holotype ♀ in B.M.
Endotricha sondaicalis Snellen ; Hampson *nec* Snellen, 1896*b* : 484.

Specimens of this species from Upper Burma have a slightly smaller hook on the end of the sacculus process and may represent a new subspecies.

Genitalia. ♂, Pl. 20, fig. 197. ♀, Pl. 33, fig. 281.

MATERIAL EXAMINED. INDIAN SUBCONTINENT (North), 5 ♂, 8 ♀ ; TIBET (South), 1 ♂ ; BURMA (Upper), 2 ♂, 4 ♀.

43. ***Endotricha ardentalis*** Hampson

(Pl. 6, fig. 88)

E. ardentalis Hampson, 1896*a* : 135. (N. India.) Holotype ♀ in B.M.

This species is known only from the type. I have examined a large number of N. Indian specimens without being able to match the genitalia of this species. It is possible that the curious structure at the opening of the bursa is a teratological condition. However, externally there are some slight differences between this species and *E. similata* Moore, so that I am retaining *ardentalis* as a good species.

Genitalia. ♀, Pl. 33, fig. 284.

MATERIAL EXAMINED. INDIAN SUBCONTINENT (North), 1 ♀.

44. *Endotricha sondaicalis* Snellen

(Pl. 2, fig. 30)

E. sondaicalis Snellen, 1880 : 200 (Celebes.) Holotype ♀ in the Leiden, Holland.
E. similata Moore ; Hampson *nec* Moore, 1896*b* : 484.

I have been unable to place this species, which is known from the type ♀ only. It may be related to *E. melanobasis* Hampson.

Genitalia. ♀ Pl. 33, fig. 285.

MATERIAL EXAMINED. CELEBES, 1 ♀ (in Leiden Mus. coll.).

45. *Endotricha costaemaculalis* Christoph

I have not seen the type of this species but have examined specimens which have been compared with the type by Dr. Kuznetzov. This species is almost identical with *E. fuscifusalis* Hampson from N. India. I have so little material available that I am placing *E. fuscifusalis* Hampson as a subspecies and describing a new, but closely related species, (*E. eximia* sp. n.) from N. India. The Russian, Chinese and Formosan specimens of *E. costaemaculalis* have small pits in the juxta of the male, whereas the Indian specimens have a smooth juxta. Intermediates occur in S. Tibet where, although the external appearance resembles that of the Indian subspecies, the juxta is slightly pitted.

Endotricha costaemaculalis costaemaculalis Christoph.

(Pl. 6, figs. 77, 79 and 80)

E. costaemaculalis Christoph, 1881 : 4. (E. Siberia.) Holotype ♀ in Leningrad Mus.
E. fuscobasalis Ragonot ; Hampson *nec* Ragonot, 1896*b* : 484.

Genitalia. ♂, Pl. 20, fig. 196. ♀, Pl. 32, fig. 278.

MATERIAL EXAMINED. EAST SIBERIA, 2 ♂, 4 ♀ ; KOREA, 1 ♀ ; CHINA, 1 ♀.

Endotricha costaemaculalis formosensis Hampson. **stat. n.**

(Pl. 6, fig. 76)

E. formosensis Hampson, 1916 : 363. (Formosa.) Holotype ♂ in B.M.

The Formosan subspecies is constant in external appearance. The genitalia are similar to the nominate subspecies.

MATERIAL EXAMINED. FORMOSA, 2 ♂, 6 ♀.

Endotricha costaemaculalis fuscifusalis Hampson. **stat. n.**

(Pl. 6, figs. 78 and 81)

E. fuscifusalis Hampson, 1896*a* : 134. (N. India.) Holotype ♂ in B.M.

The subterminal line is straight and lacks the " elbow " present in the nominate subspecies. Usually slightly larger than the nominate subspecies, it lacks the pitting on the juxta of the male. The genitalia are otherwise similar to the nominate subspecies.

MATERIAL EXAMINED. INDIAN SUBCONTINENT (North), 4 ♂, 5 ♀; TIBET (South), 3 ♂; CHINA (South), 1 ♂, 1 ♀.

46. *Endotricha eximia* sp. n.

(Pl. 6, figs. 82 and 85)

♂. Wing 9 mm. Head light grey-brown. Thorax grey-brown with white tegulae. Abdomen grey-brown suffused with black.

Forewing. Subapical part of fringe white, rest smoky grey. Terminal margin with small black dots. Terminal area reddish brown suffused with black. Subterminal line white edged with black, in costal quarter turns away from terminal margin of wing then descends downwards to hind margin of wing. Subterminal area blackish brown, lighter in costal quarter. Median band white, curved, edged with black. Sub-basal area suffused with orange-brown scales, intermixed with black. Basal area brown, irrorate with black. Costal margin black, interrupted with white semilunar marks, each with a darker central spot.

Hindwing. Ground colour off-white. Usually two white sinuous median lines edged with black, becoming very faint anteriorly.

Underside. Paler, distinct discal spot. Subterminal line conspicuous, black. Hindwings crossed by two prominent, black, slightly sinuous lines.

♀. Similar, basal area of forewing light brown with less black suffusion.

Genitalia. ♂, Pl. 21, fig. 202. ♀, Pl. 33, fig. 279.

This species is related to *E. costaemaculalis fuscifusalis* Hampson. It differs in the smaller size and paler hind wings. The male genitalia differ in the shape of the juxta and the presence of a thin line of spines in the aedeagus (there is a plate of spines in subsp. *fuscifusalis* Hamps.). The subterminal line of *eximia* Whalley varies in different specimens, and may be broken or heavily irrorate with black scales.

MATERIAL EXAMINED. Holotype ♂, INDIAN SUBCONTINENT (North), " Khasis, 1897 " Brit. Mus. slide No. 4654, in B.M.

Paratypes. INDIAN SUBCONTINENT (North), 4 ♂, 1 ♀, (data as type); 1 ♀ " Sikkim ", in Warsaw Museum.

47. *Endotricha fuscobasalis* Ragonot

(Pl. 6, figs. 83 and 86)

E. fuscobasalis Ragonot, 1891 : 526. (Punjab, Pakistan.) Holotype ♂ in Paris Mus.
E. costaemaculalis Christoph. ; *auctt.* (misidentification.)

The type specimen has a label in Meyrick's handwriting:—"seems to be *aethiopa* [i.e. *E. aethopa* Meyrick] but specimen is too worn ". In fact this is a very distinct species as can be seen from the genitalia. The large black patches on the anterior margin of the hind wing of *E. fuscobasalis* are particularly conspicuous. The ♀ is unknown.

Genitalia. ♂, Pl. 19, fig. 193.

MATERIAL EXAMINED. INDIAN SUBCONTINENT (North), 3 ♂.

THE *NIGROMACULATA* SPECIES GROUP

The next seven species are a heterogeneous collection but form a transitional series between the *costaemaculalis* species group and the *rhodomicta* species group. *E. borneoensis* is peculiar in the distinctive shape of the sacculus process.

48. *Endotricha melanobasis* Hampson

(Pl. 6, fig. 89)

E. melanobasis Hampson, 1916 : 358. (N. India.) Holotye ♂ in B.M.

Genitalia. ♂, Pl. 20, fig. 199. ♀, Pl. 33, fig. 282.

MATERIAL EXAMINED. INDIAN SUBCONTINENT (North), 12 ♂, 1 ♀.

49. *Endotricha nigromaculata* sp. n.

(Pl. 6, figs. 84 and 87)

♂. Wing 9 mm. Head, thorax reddish purple.

Forewing. Fringe white. Terminal line black interrupted. Terminal area pinky mauve. Subterminal line indistinct posteriorly, sinuous, white. Conspicuous median curved fascia, white edged with black, curving regularly with apex of curve towards termen of wing. Costal margin of basal area brownish. Hind part of basal area with conspicuous black rectangle.

Hindwing. Terminal and subterminal areas pinky mauve. Median area whitish, edged with sinuous fascia white-edged with black. Basal area brown.

Underside. Paler than upperside.

♀. Wing 8 mm. Fringe with base purplish. Rest of fore and hind wing dull brown suffused with black. Small black discal spot. Underside paler. Subterminal fascia visible on hinder part of forewing.

Genitalia. ♂, Pl. 21, fig. 203. ♀, Pl. 28, fig. 248.

This species of *Endotricha* stands out from all the others by the striking black patch at the base of the forewing being clearly rectangular. The shape of the valve process resembles *E. fastigia*, sp. n., from New Guinea.

MATERIAL EXAMINED. Holotype ♂, INDIAN SUBCONTINENT (North), " Khasis, Native coll." Brit. Mus. slide No. 4881, in B.M.

Paratypes. INDIAN SUBCONTINENT, 1 ♂, 3 ♀, (data as type).

50. *Endotricha fastigia* sp. n.

(Pl. 7, figs. 91 and 94)

♂. Wing 9 mm. Head and thorax dark purplish red.

Forewing. Costal margin strongly concave, apex of wing very pointed. Fringe yellow. Terminal line of small black dots. Terminal area reddish purple. Subterminal line sinuous, pale. Subterminal area reddish yellow in costal part, hind part purplish red irrorate with black. Anterior part of median area yellowish on costal margin, narrowing posteriorly to thin line opening posteriorly. Rest of forewing purplish red.

Hindwing. Apex yellow, terminal and subterminal areas purplish red, decreasing in width posteriorly. Median area yellowish white narrowly edged with black. Basal and sub-basal areas purplish red.

Underside. Similar, paler. Median area with conspicuous fascia consisting of white edged with black on either side.

♀. Similar, paler. Apex of forewing less pointed.

Genitalia. ♂, Pl. 18, fig. 185. ♀, pl. 33, fig. 286.

The concave costa and distinctly pointed apex of the forewings make this species easily identifiable. Some variation in the shape of the median band occurs. This species is related to *E. rhodomicta* Hamps.

MATERIAL EXAMINED. Holotype ♂, NEW GUINEA, "Hydrographer Mts., 2,500 ft., May 1918, (Eichhorn Bros.)", Brit. Mus. slide No. 4783, in B.M.

Paratypes. NEW GUINEA, 2 ♂, 1 ♀, (data as type); 1 ♂, 1 ♀, "Biagi, Mambare R., 5,000 ft. (Meek)".

51. *Endotricha hœnei* sp. n.

(Pl. 7, fig. 99)

♂. Wing 10 mm. Head. Crown and frons yellowish. Thorax reddish brown suffused with yellow scales.

Forewing. General colour mauvish brown. Median band yellowish white. Fringe white anteriorly, black posteriorly. Terminal margin black. Terminal area mauve. Costal margin brown interrupted with white spots. Median area yellowish white, broad on costal margin, constricted posteriorly, almost disappearing on hind margin. Basal area brown, less mauve visible than distal part of wing.

Hindwing. Similarly coloured to forewing. Median yellowish white band broader, not narrowing posteriorly.

Underside. Paler, discal spot conspicuous, black. Sinuous subterminal line appears towards hind margin of forewing. Postmedian, narrow yellowish white band, similar antemedian one. Median band broader than on upperside.

♀. Unknown.

Genitalia. ♂, Pl. fig. 19, 194.

Externally, this species resembles a pale *E. metacuralis* Hampson (Formosa) but the genitalia are distinct.

MATERIAL EXAMINED. Holotype ♂, CHINA, "Linping, Kwangtung, 18.5.22 (Höne)", Brit. Mus. slide No. 6159, in Höne coll, Bonn.

Paratypes. CHINA, 2 ♂, (data as type).

52. *Endotricha metacuralis* Hampson

(Pl. 7, fig. 96)

E. metacuralis Hampson, 1916 : 364. (Formosa.) Holotype ♀ in B.M.

Genitalia. ♂, Pl. 21, fig. 204. ♀, Pl. 33, fig. 283.

MATERIAL EXAMINED. FORMOSA, 1 ♂, 6 ♀.

53. *Endotricha faceta* sp. n.

(Pl. 7, figs. 98 and 101)

♂. Wing 12·5 mm. Head and thorax deep pinky red. Tegulae long, pinky red, black tipped.

Forewing. Fringe yellow. Terminal margin with a few black spots. Terminal area purplish irrorate with black. Subterminal line indistinct. Subterminal area orange-brown. Discal spot black, small. Median band yellow ochre. Antemedian line faintly black, basal area purplish red, irrorate with black. Costal margin with a few small white spots extending from the apex of the wing as far as the median area. Costal margin purplish red.

Hindwing. Mainly yellow, small purplish red mark near hind apex. Basal area purplish red.

Underside. Paler, hind wings all yellow with distinct ante- and postmedial lines, sinuous, red.

♀. Head and thorax dark pinky red.

Forewing. Entirely reddish brown with a faint discal orange-brown spot. Fringe bright yellow. Costal margin with white spots extending from apex to antemedial line.

Hindwing. Pale yellow, fringe bright yellow. Dark ante- and postmedial fascia. Median band reddish, obscure posteriorly. Basal area and area of vein *1A* to hind margin dark purple-red.

Genitalia. ♂, Pl. 20, fig. 200. ♀, Pl. 34, fig. 287.

This is a very striking species and shows some similarities in the ♂ genitalia with *E. rhodomicta* Hampson.

MATERIAL EXAMINED. Holotype ♂, NEW GUINEA, " Mt. Goliath, about 130° long., Feb., 1911, (Meek) ", Brit. Mus. slide No. 4784, in B.M.

Paratypes. NEW GUINEA, 6 ♂, 1 ♀, (data as type) ; 1 ♀, " Mt. Tafa, 8,500 ft., Mar. 1934 (Cheesman) ".

54. *Endotricha borneoensis* Hampson

(Pl. 7, fig. 100)

E. borneoensis Hampson, 1916 : 365. (Sarawak.) Holotype ♂ in B.M.
Doththa mesenterialis var. Walker, 1859, 19 : 920.

The type of *borneoensis* is badly damaged and lacks an abdomen. This species is similar externally to *E. persicopa* Meyrick, from which it can be distinguished by the hindwing having only a trace of dark red at the apex of the wing, instead of all down the margin as in *persicopa*. The genitalia are very distinct. The Malayan specimens are slightly larger than the more southern specimens and may represent a new subspecies.

Genitalia. ♂, Pl. 20, fig. 201. ♀, Pl. 34, fig. 288.

MATERIAL EXAMINED. SARAWAK, 1 ♂ ; SOLOMON IS., 1 ♀ ; NEW GUINEA, 3 ♀ ; MALAYA, 1 ♂.

THE *RHODOMICTA* SPECIES GROUP

The genitalia of the species in this group and their very similar external appearances suggests that they are closely related. The last three species (*aureorufa*, *rhodomicta* and *munroei*) are sibling species. They appear to be geographically isolated in New Guinea but further collecting may show that their distribution overlaps.

55. ***Endotricha persicopa*** Meyrick

This is a bright pink and yellow species, easily separated from most other species in the genus. It is very constant in colour over its whole geographic range. The female of this species is peculiar in the genus *Endotricha* in having a stout spine on the signum of the bursa which projects into the cavity of the bursa itself.

Endotricha persicopa persicopa Meyrick

(Pl. 7, fig. 103)

E. persicopa Meyrick, 1889 : 506. (New Guinea.) Lectotype ♀ selected from syntypes ex. Meyrick coll. labelled, " New Guinea, S., [18]88 ", in B.M.
E. buralis Holland, 1900 : 582. (Buru I.) Holotype ♂ in Pittsburg, U.S.A., **syn. n.**

Genitalia. ♂, Pl. 21, fig. 206. ♀, Pl. 34, fig. 289.

MATERIAL EXAMINED. NEW GUINEA, 18 ♂, 23 ♀; NEW IRELAND, 1 ♂, 1 ♀; GOODENOUGH I., 3 ♂, 2 ♀ ; BURU I., 1 ♂ (in Carnegie Mus., Pittsburg, U.S.A.).

Endotricha persicopa paliolata Hampson. **stat. n.**

(Pl. 7, fig. 104)

E. paliolata Hampson, 1916 : 365. (Louisiade Archipelago.) Holotype ♂ in B.M.

The females of this species have the same peculiar spine in the bursa as the nominate subspecies.

Genitalia. ♂, Pl. 21, fig. 207 ; ♀, similar to nominate subspecies.

MATERIAL EXAMINED. ST. AIGNANS, 1 ♂; ROSSELL I., 5 ♂, 8 ♀; SUDEST I., 4 ♂, 6 ♀.

56. ***Endotricha euphiles*** Turner

(Pl. 8, fig. 106)

E. euphiles Turner, 1932 : 190. (Australia). Holotype ♂ in Queensland Mus., Brisbane, Australia.

I have not examined the type but have seen a paratype ♂ of this species. Externally the bright pink of this species resembles *E. flavifusalis* Warren but in the ♂ genitalia it is similar to *E. persicopa* Meyrick, of which it may be a subspecies.

Genitalia. ♂, Pl. 21, fig. 205.

MATERIAL EXAMINED. AUSTRALIA, 2 ♂ (1 ♂ in Queensland Mus., 1 ♂ in C.S.I.R.O., Canberra).

57. ***Endotricha rhodomicta*** Hampson

(Pl. 7, fig. 97)

E. rhodomicta Hampson, 1916 : 365. (New Guinea.) Holotype ♂ in B.M.

The specimen labelled " Type ♀, *rhodomicta* Hampson " by Hampson has proved to be a distinct species (*E. aureorufa* sp. n.). Externally *rhodomicta* is very similar

to *aureorufa*, but in the latter the patch of orange yellow on the median portion of the costa is larger and the whole insect is a more orange yellow than *rhodomicta*, which is lemon yellow.

Genitalia. ♂, Pl. 22, fig. 208. ♀, Pl. 34, fig. 292.

MATERIAL EXAMINED. NEW GUINEA, 9 ♂, 7 ♀.

58. *Endotricha aureorufa* sp. n.

(Pl. 7, figs. 92 and 95)

♂. Wing 11·5 mm. Head and thorax reddish brown. Tegulae long, reddish brown with black scales. Abdomen reddish brown with prominent coremata.

Forewing. Fringe yellow. Terminal line interrupted, black. Subterminal area pinky red. Subterminal line sinuous, yellowish. Costal margin with small yellow spots on apical third. Subterminal area pinky red, irrorate with brown, broad costal edge becoming narrower posteriorly. Broad median area golden yellow, orange-yellow in costal portion, broader posteriorly. Basal and sub-basal areas reddish brown.

Hindwing. Outer two-thirds all yellow. Narrow median sinuous brown line. Basal area reddish brown.

Underside. Paler median band, more pinky red on costal portion. Hindwings with conspicuous ante- and post-medial lines. Discal spot conspicuous.

♀. Similar, median line on hind wing more conspicuous, subterminal area of forewing more pinky red.

Genitalia. ♂, Pl. 22, fig. 209. ♀, Pl. 34, fig. 291.

MATERIAL EXAMINED. Holotype ♂, NEW GUINEA, " Mt. Goliath, 1911 (Meek) " Brit. Mus. slide No. 4896, in B.M.

Paratypes. NEW GUINEA, 4 ♂, 6 ♀ (data as type).

59. *Endotricha munroei* sp. n.

(Pl. 7, fig. 93)

♂. Wing 12·5 mm. Head reddish purple. Thorax reddish purple suffused with orange-brown. Tegulae long whitish. Abdomen purplish brown. Coremata prominent, orange-brown.

Forewing. Fringe yellow. Terminal line black, interrupted. Narrow terminal band of pinky red. Subterminal line consisting of small, separate, dark hemispheres. Discal area bright orange-yellow. Median band pale sulphur yellow, broader posteriorly. Discal spot black, comma-shaped. Rest of forewing reddish brown suffused with pinky red and black scales.

Hindwing. Fringe yellow. Terminal line brown, interrupted. Basal part of wing reddish brown suffused with pinky red and black scales. Hind margin and rest of wing pale sulphur yellow.

Underside. Similar, paler. Median line on hindwing zig-zag (not visible on upper side).

♀. Forewing similar, more pinky red suffusion and yellow paler. Hindwing with only median area pale sulphur yellow, broadening anteriorly. Terminal margin reddish brown, pale anteriorly. Median line black, conspicuous.

Genitalia. ♂, Pl. 22, fig. 210. ♀, Pl. 35, fig. 298.

This species is very similar both to *rhodomicta* Hampson and *aureorufa* Whalley but can be separated by its larger size and, in the male, by the differences in the aedeagus and juxta.

MATERIAL EXAMINED. Holotype ♂, NEW GUINEA, " Edie Cr., nr. Wau, Morobe District, 6,800 ft., 21–22 Sept. 1957 (Munroe and Holland) " Brit. Mus. slide No. 4938, in Canadian Nat. Coll.

PARATYPES. NEW GUINEA, 8 ♂, 3 ♀, (data as type) in Canadian Nat. Coll. ; 1 ♂, " Mondo, 5,000 ft., 1.ix.34, (Cheesman) ; 2 ♂, ' Mt. Tafa, 8,500 ft., 1.ix.34 (Cheesman) ' ".

THE *FLAVIFUSALIS* SPECIES GROUP

The next five species fall into this group. *E. sandaraca* sp. n. and *E. rufofimbrialis* Warren are closely related. These two species are geographically isolated in Borneo and appear to have diverged sufficiently from one another to deserve specific rather than subspecific status.

60. ***Endotricha flavifusalis*** Warren

(Pl. 8, figs. 107 and 110)

E. flavifusalis Warren, 1891 : 70. (Sarawak). Lectotype ♀ selected, labelled, " Sarawak ", in B.M.

This species was described by Warren from one ♂ and one ♀ from Sarawak. The ♂ was subsequently selected by Hampson as the type of *E. borneoensis*. I have not seen a ♂ of *E. flavifusalis* from Sarawak but have selected the ♀ used in the original description as lectotype.

Genitalia. ♂, Pl. 23, fig. 214. ♀, Pl. 35, fig. 297.

MATERIAL EXAMINED. SARAWAK, 1 ♀ ; SUDEST I., 4 ♂, 6 ♀ ; ROSSELL I., 5 ♂, 4 ♀ ; ST. AIGNANS, 3 ♂, 1 ♀ ; WOODLARK I., 1 ♂, 2 ♀ ; MALAYA, 1 ♀.

61. ***Endotricha rufofimbrialis*** Warren

(Pl. 7, fig. 102 and 105)

E. rufofimbrialis Warren, 1891 : 69. (Sarawak.) Holotype ♀ in B.M.

The type specimen is in very bad condition, but specimens from Mt. Dulit (Sarawak) appear to be similar to it. This species is similar to *E. sandaraca* Whalley in genitalia, but is much smaller and with a slightly different pattern. There is one ♀ specimen from Bhutan which may be conspecific with this species.

Genitalia. ♂, Pl. 22, fig. 211. ♀, Pl. 35, fig. 299.

MATERIAL EXAMINED. SARAWAK, 4 ♂, 4 ♀ ; BORNEO, 1 ♀ ; (INDIAN SUBCONTINENT (North), 1 ♀).

62. ***Endotricha luteobasalis*** Caradja

(Pl. 6, fig. 90)

E. luteobasalis Caradja, 1935 : 29. (China.) Lectotype ♂ selected, labelled, " West Tienmu shan, China " in Natural History Mus., Bucharest.

I have examined one ♂ of this species from the original series of five specimens in the Caradja coll. This species shows some similarities to *rufofimbrialis* Warren. The ♀ is unknown.

Genitalia. ♂, Pl. 22, fig. 212.

MATERIAL EXAMINED. CHINA, 1 ♂ (in Nat. Hist. Mus., Bucharest).

63. *Endotricha sandaraca* sp. n.

(Pl. 8, figs. 108 and 111)

♂. Wing 11 mm. Head, crown yellow, frons red. Thorax reddish brown. Abdomen reddish brown. Coremata large, brown.

Forewing. Fringe bright yellow. Terminal line black, interrupted. Subterminal band pinky red. Subterminal line pale, sinuous, edged on outer margin with black. Subterminal area reddish brown, orange-brown along costal margin. Median area yellowish brown. Basal and sub-basal area reddish brown. Costal margin black with small white spots.

Hindwing. Fringe bright yellow. Terminal line black. Terminal area reddish brown edged with black anteriorly, narrowing posteriorly and becoming reddish purple. Median area large, bright yellow. Basal area reddish brown.

Underside. Similar, paler.

♀. Generally a dull brown colour. Discal spot black. Fringe bright yellow. Median band on hind wing almost obscure.

Genitalia. ♂, Pl. 22, fig. 213. ♀, Pl. 34, fig. 295.

This species is very conspicuous with the bright yellow hindwing. It is related to *E. rufofimbrialis* Warr.

MATERIAL EXAMINED. Holotype ♂, BORNEO, " Mt. Kinabalu, N. Borneo, 7,000 ft., May 31 1929 ", Brit. Mus. slide No. 4754, in B.M.

Paratypes. BORNEO, 18 ♂, 18 ♀, (data as type).

64. *Endotricha semirubrica* sp. n.

(Pl. 8, fig. 109)

♂. Wing 10 mm. Head yellowish, thorax and abdomen reddish brown suffused with yellow.

Forewing. Fringe yellow near apex of wing, reddish in posterior part. Terminal line with small black semilunar spots. Terminal area brown crossed by bands of red along veins. Subterminal line sinuous white, with red scales. Hind part of median area yellow. Discal spot black, comma-shaped. Rest of forewing brown, suffused with black. Reddish scales along veins.

Hindwing. Similar. Yellow medium band right across wing, broader than on forewing.

Underside. Similar, paler.

♀. Unknown.

Genitalia. ♂, Pl. 23, fig. 215.

Externally this species is similar to both *rufofimbrialis* Warr. and *sandaraca* Whalley, but the genitalia are very distinct.

MATERIAL EXAMINED. Holotype ♂, SARAWAK, " Poeh Mts., 3,500 ft., (Everett) ", Brit. Mus. slide No. 4580, in B.M.

Paratypes. MALAYA, 1 ♂, " Pahang, Cameroon Highlands, 8,700 ft., Dec. 1939 " ; 1 ♂, " Selangor Bukit Kuntu, 3,300 ft., (Pendlebury) " ; 1 ♂, " Pahang, Frazer Hill, 4,000 ft., 1932 " ; 1 ♂, " Pahang, Sungu Renglet, 1925, (Pendlebury) ".

THE *DENTICOSTALIS* SPECIES GROUP

The next six species form a less compact group than the preceding one.

65. ***Endotricha denticostalis*** Hampson

(Pl. 8, figs. 112 and 115)

E. denticostalis Hampson, 1906 : 210. (Pulo Laut.) Holotype ♂ in B.M.

The few specimens of this species examined are constant in colour. The costal margin of the forewing shows clearly the patches of scales giving the " toothed costa " of its name.

Genitalia. ♂, Pl. 23, fig. 216. ♀, Pl. 35, fig. 300.

MATERIAL EXAMINED. BORNEO, 2 ♂, 1 ♀ ; PULO LAUT, 1 ♂.

66. ***Endotricha conchylaria* sp. n.**

(Pl. 9, fig. 128)

♂. Wing 11·5 mm. Head light reddish brown. Thorax reddish purple with yellowish brown tegulae. Abdomen brown. Coremata yellowish, conspicuous.

Forewing. Fringe white with black dots near the base. Terminal margin reddish purple with small semilunar black dots. Terminal band reddish purple. Narrow, sinuate, subterminal line white. Subterminal band reddish purple irrorated with black. Median band yellow, continued along costal margin as a narrow strip to the subterminal line.

Antemedial line thin, sinuous white, indistinct. Basal area reddish purple irrorated with yellow, particularly in posterior half. Inconspicuous black discal spot.

Hindwing. Subterminal line black, interrupted. Broad border purplish red irrorated with black. Median band yellow edged on both sides with sinuous white line. Basal area purplish red.

Underside. Paler, subterminal line sharply curved inwards in middle third. Comma-shaped discal spot surrounded by yellow scales.

♀. Unknown.

Genitalia. ♂, Pl. 23, fig. 217.

Externally, this species is like *E. albicilia* Hamps. but the genitalia are quite distinct.

MATERIAL EXAMINED. Holotype ♂, NEW GUINEA, " Eitape, on coast 90 miles from Dutch border, 1917 ", Brit. Mus. slide No. 4760, in B.M.

Paratypes. MOLUCCAS, 1 ♂, " Batjan, Aug. 1897 (Doherty) " ; 1 ♂, " Obi Major (Waterstradt) ".

67. *Endotricha capnospila* Meyrick

(Pl. 8, figs. 113 and 116)

E. capnospila Meyrick, 1932 : 247. (Fiji.) Lectotype ♂ selected, labelled " Lautoka, Fiji., H.P., 28.x.30, Pyralidae, Brit. Mus. slide no. 4547 ", in B.M.

Externally this species is like *E. simplex* Janse, but it can be separated from the male of that species by the large black oval scale patch at the base of veins Cu_{1a} and M_3 in the hind wing of *capnospila*.

Genitalia. ♂, Pl. 24, fig. 223. ♀, Pl. 35, fig. 302.

MATERIAL EXAMINED. FIJI, 2 ♂, 2 ♀.

68. *Endotricha chionocosma* Turner

(Pl. 8, fig. 120)

E. chionocosma Turner, 1904 : 182. (Australia.) Holotype ♀ in C.S.I.R.O., Canberra, Australia.

This species is known only from the type.

Genitalia. ♀, Pl. 35, fig. 301.

MATERIAL EXAMINED. AUSTRALIA, 1 ♀ (in C.S.I.R.O., coll.).

69. *Endotricha albicilia* Hampson

(Pl. 8, figs. 118 and 119)

E. albicilia Hampson, 1891 : 130. (N. India.) Holotype ♂ in B.M.
E. albicilia Hampson ; Hampson *nec* Wileman ; Inoue, 1955 : 146.

Wileman (1911 : 368), records this species from Japan. This is incorrect since this species appears to be confined to the Indian subcontinent, Ceylon and the Andaman Is. Inoue (1955 : 146) suggests that the Japanese record of *E. albicilia* is a misidentification of *E. consocia* Butler which I think is correct. He, however, attributes *albicilia* to Wileman whereas it is a Hampson species.

Genitalia. ♂, Pl. 24, fig. 224. ♀, Pl. 35, fig. 303.

MATERIAL EXAMINED. INDIAN SUBCONTINENT, 14 ♂, 4 ♀; CEYLON, 2 ♂, 4 ♀; ANDAMAN IS., 4 ♂, 4 ♀.

70. *Endotricha fuliginosa* sp. n.

(Pl. 8, figs. 114 and 117)

♂. Wing 11 mm. Head and thorax reddish, suffused with yellow scales. Tegulae reddish pink. Abdomen brown.

Forewing. Costa concave, with a distinct angle $\frac{1}{3}$ from apex. Fringe white, base of fringe pinky red. Terminal line a few widely separated black dots. Terminal area narrow, reddish pink. Subterminal line sinuous, indistinct posteriorly. Subterminal area orange-brown, anteriorly suffused with black, dark posteriorly. Median area and basal area pinky red heavily suffused with black scales. Costal margin with small white spots.

Hindwing. Similar, but median area clearly defined by black and white fascia. Median area pinky red. Basal area brown.

Underside. Smoky grey, conspicuous yellow hairs in anal area of forewing projecting downwards and large smoky black area in anterior part of hindwing.

♀. Unknown.

Genitalia. ♂, Pl. 23, fig. 218.

This species is related to *E. cruenta*, sp. n.

MATERIAL EXAMINED. Holotype ♂, NEW GUINEA, " Hydrographer Mts., Jan. 1918 (Eichhorn) ", Brit. Mus. slide No. 4769, in B.M.

Paratypes. NEW GUINEA, 2 ♂, " Upper Aroa River, 1903 (Meek) "; 1 ♂, " Cyclops Mts., Sabron Camp, 1,200 ft., 15.v.36, (Cheesman) ".

71. *Endotricha cruenta* sp. n.

(Pl. 9, fig. 129)

♂. Wing 11 mm. Head and thorax bright red suffused with yellow scales. Tegulae red with yellow scales.

Forewing. Fringe pale yellow, base of fringe black. Terminal line yellowish edged with black. Terminal area deep reddish purple. Subterminal area reddish, costal part narrowly orange. Median area yellow on antemedial side, yellow suffused with red postmedially. Postmedial line indistinct. Antemedial line almost straight. Sub-basal area bright reddish purple. Basal area yellow, red on costal portion. Costal margin reddish purple with white spots, orange between apex and portion of postmedial line.

Hindwing. Terminal and subterminal band reddish purple, broad anteriorly, narrowing posteriorly. Rest of hind wing yellow.

Underside. Similar, legs red.

♀. Paler, more brown in subterminal area. Yellow band on forewings narrower. Basal area brown. Reddish brown basal area in hindwing.

Genitalia. ♂, Pl. 23, 219. ♀, Pl. 37, fig. 313.

The specimens of this species that I have examined vary in the intensity of the colour. The Snow Mts. specimen has a larger patch of yellow on the hindwings. The size also varies, the wing of the Kokoda male being 9 mm. against 11 mm. of the type. The genitalia of all the males are identical. This species has a similar genitalia structure to *E. fuliginosa* Whalley to which it is probably related.

MATERIAL EXAMINED. Holotype ♂, NEW GUINEA, " Upper Aroa River, Febr. 1903 (Meek) ", Brit. Mus. slide No. 4755, in B.M.

Paratypes. NEW GUINEA, 1 ♂, " Kokoda, 1,200 ft. vii.33, (Cheesman) "; 1 ♂, " Upper Setakwa River, Snow Mts., Sept. 1910 "; 1 ♂, " Waigeu, Camp Nok, 2,500 ft., iv.38, (Cheesman) ".

THE *SIMPLEX* SPECIES GROUP

The next two species have developed a totally distinct external appearance on one small island. The subspecies of *simplex* presents a more typical " *Endotricha* " appearance than the nominate one.

72. *Endotricha simplex* Janse

This species is probably related to *E. capnospila* Meyr. The species in the *simplex* group are probably derived from a common ancestor and have diverged on the islands of the Moluccas.

Endotricha simplex simplex Janse

(Pl. 9, figs. 121 and 124)

E. simplex Janse, 1924 : 506. (Moluccas Is.) Holotype ♂ in Transvaal Museum coll., Pretoria S. Africa.

This subspecies is larger than subsp. *rosselli*, (wingspan 26 mm. *simplex, rosselli* 22 mm.).

Genitalia. ♂, Pl. 24, fig. 220. ♀, Pl. 36, fig. 305.

MATERIAL EXAMINED. MOLUCCAS IS., 4 ♂, 3 ♀ (2 ♂ and 2 ♀ in Transvaal Mus.).

Endotricha simplex rosselli subsp. n.

(Pl. 9, fig. 127)

♂. Wing 11 mm. Head and thorax rust brown. Abdomen brown. Coremata conspicuous, rust brown.

Forewing. General colour dark rust brown, almost unmarked. Fringe white. Subterminal line yellowish near costa, obscure further back. Faint lines on each side of edge of median area. Costal margin with a few small light areas.

Hindwing. Outer margin rusty brown terminating before the hind margin of the wing. Anterior part of marginal area yellowish buff. Two faint yellowish buff median lines. Basal area yellowish buff.

♀. General colour slightly less red than male, no yellowish buff on hind wings. Median band of hind wing reddish brown faintly continued to forewing. Fringe white.

Genitalia. ♂, Pl. 24, fig. 222. ♀, as nominate subspecies (Pl. 36, fig. 305).

Some variation in size and colour is shown by this subspecies. It is much smaller than the nominate race (wing 13 mm. in the nominate race).

MATERIAL EXAMINED. Holotype ♂, LOUISIADE ARCHIPELAGO, " Rossell I., Mt. Rossell (Eichhorn), 26.iii.15 ", Brit. Mus. slide No. 4555, in B.M.

Paratypes. LOUISIADE ARCHIPELAGO, 6 ♂, 4 ♀, (data as type) ; 3 ♂, " Sudest I." ; 1 ♀, " Squally I.".

73. *Endotricha variabilis* Janse

(Pl. 9, figs. 122 and 125)

E. variabilis Janse, 1924 : 504. (Moluccas Is.) Holotype ♂ in Transvaal Mus. coll., Pretoria S. Africa.

Genitalia. ♂, Pl. 24, fig. 221. ♀, Pl. 36, fig. 304.

MATERIAL EXAMINED. MOLUCCAS IS., 4 ♂, 4 ♀ (2 ♂, 2 ♀ in Transvaal Mus. coll.).

THE *ENCAUSTALIS* SPECIES GROUP

The next four species are not closely related. They are all from the Australian-New Guinea region.

74. *Endotricha encaustalis* Hampson

(Pl. 9, fig. 132)

E. encaustalis Hampson, 1916 : 359. (New Guinea.) Holotype ♂ in B.M.

Genitalia. ♂, Pl. 24, fig. 225. ♀, Pl. 36, fig. 306.

MATERIAL EXAMINED. NEW GUINEA, 8 ♂, 2 ♀.

75. *Endotricha approximalis* Snellen

(Pl. 9, fig. 135)

E. approximalis Snellen, 1895 : 115. (Java.) Lectotype ♀ in Leiden, Holland.
E. xanthorhodalis Hampson, 1916 : 360. (Australia.) Holotype ♂ in B.M. **syn. n.**
E. periphaea Turner, 1937 : 69. (Australia.) Holotype ♀ in C.S.I.R.O., Canberra, Australia, **syn. n.**

It is possible that the Australian-New Guinea specimens may represent a subspecies, but more material is needed. The single specimen from the Philippines is very similar to the type of the species.

Genitalia. ♂, Pl. 26, fig. 235. ♀, Pl. 37, fig. 310.

MATERIAL EXAMINED. JAVA, 1 ♀ (lectotype, in Leiden); PHILIPPINES, 1 ♂; NEW HEBRIDES, 2 ♂, 2 ♀; WOODLARK IS., 1 ♂; NEW GUINEA, 1 ♂; AUSTRALIA, 6 ♂, 8 ♀.

76. *Endotricha dispergens* Lucas

(Pl. 9, figs. 123 and 126)

E. dispergens Lucas, 1891 : 306. (Australia.) Holotype ♂ in S. Australian Mus., Adelaide, Australia.

The abruptly truncate forewing of the ♂ of this species easily separates it from any other known species of *Endotricha*.

Genitalia. ♂, Pl. 26, fig. 233. ♀, Pl. 37, fig. 311.

MATERIAL EXAMINED. AUSTRALIA, 19 ♂, 4 ♀.

77. *Endotricha pyrosalis* Guenée

(Pl. 9, figs. 131 and 134)

E. pyrosalis Guenée 1854 : 219. (Australia.) Holotype ♂ in Paris Mus.
Messatis sabirusalis Walker, 1859, 19 : 918. (Australia.) Holotype ♂ in B.M.
Tricomia auroralis Walker, 1865, 34 : 1259. (Australia.) Holotype ♀ in B.M.
Pacoria albifimbrialis Walker, 1865, 34 : 1255. (Australia.) Holotype ♂ in B.M.
Rhodaria robinia Butler, 1882 : 96. (Australia.) Holotype ♂ in B.M.
Endotricha ignealis Guenée ; Hampson *nec* Guenée, 1896*b* : 483.

This species was recorded from New Zealand by Hudson (1928 : 205) as having been captured on Mt. Denman in 1911, this is the only record of this species outside Australia and Tasmania.

Genitalia. ♂, Pl. 26, fig. 232. ♀, Pl. 37, fig. 312.

MATERIAL EXAMINED. AUSTRALIA, 17 ♂, 4 ♀; TASMANIA, 1 ♂.

THE *PSAMMITIS* SPECIES GROUP

The position of the next two species is uncertain. They are closely related to one another and may be geographical representatives of the same species.

78. *Endotricha psammitis* Turner

(Pl. 10, fig. 137)

E. psammitis Turner, 1904 : 183. (Australia.) Holotype ♂ in C.S.I.R.O. coll., Canberra, Australia.

E. lignitalis Hampson, 1916 : 360. (Australia.) Holotype ♂ in B.M., **syn. n.**

Genitalia. ♂, Pl. 26, fig. 236. ♀, Pl. 34, fig. 296.

MATERIAL EXAMINED. AUSTRALIA, 3 ♂ (1 ♂ in C.S.I.R.O. coll.); TAMBORA I., 2 ♂; SELAYER I., 21 ♂, 7 ♀.

79. *Endotricha nicobaralis* Hampson

(Pl. 10, fig. 138)

E. nicobaralis Hampson, 1906 : 210. (Nicobar Is.) Holotype ♂ in B.M.

Genitalia. ♂, Pl. 26, fig. 234. ♀, Pl. 37, fig. 314.

MATERIAL EXAMINED. NICOBAR IS., 2 ♂, 1 ♀; LOWER BURMA, 3 ♂, 2 ♀.

THE *COREACEALIS* SPECIES GROUP

The next seven species all show some degree of reduction of the gnathus, but the gnathus arms are always present.

80. *Endotricha coreacealis* Pagenstecher

(Pl. 9, figs. 130 and 133)

E. coreacealis Pagenstecher, 1884 : 266. (Amboina.) I have been unable to trace the type of this species and therefore erect a neotype labelled " Amboyna, Feb., 1892, W. Doherty," in B.M.

The forewing of this species has *Sc* and R_1 anastomosing, a condition also found in *E. chionosema* Hampson. The ♀ is unknown.

Genitalia. ♂, Pl. 25, fig. 226.

MATERIAL EXAMINED. AMBOINA, 3 ♂; NEW GUINEA, 8 ♂.

81. *Endotricha luteopuncta* sp. n.

(Pl. 10, fig. 140)

♂. Wing 10 mm. Head, thorax light brown, irrorate with darker brown.

Forewing. Large circular yellow spot between veins $1A$ and Cu_{1b}. Small black discal spot. Fringe dark red and black. Terminal line black, interrupted. Subterminal area reddish purple. Subterminal line sinuous. Rest of wing reddish brown, paler in basal and sub-basal areas.

Hindwing. Apex white, yellow streak running length of cell. Rest of hind wing reddish brown, paler in basal area. Terminal area reddish.

Underside. Paler, smoky black line extending from subterminal line to basal area across forewing.

♀. Darker reddish brown, lacks yellow median spot. Median band of hind wing feebly marked.

Genitalia. ♂, Pl. 25, fig. 227. ♀, lacks abdomen.

The conspicuous yellow spot in the forewing of the male is the most obvious external character. This species resembles *E. coreacealis* Pag. in external shape, while the genitalia show similarities with *E. lobibasalis* Hamps.

Material examined. Holotype ♂, Solomon Is., " Guadalcanal, Tapananje, Dec. 1955, (Bradley) ", Brit. Mus. slide No. 4764, in B.M.

Paratypes, Solomon Is., 5 ♂, 1 ♀, " Bougainville, 1904 (Meek) " ; 2 ♂, " Guadalcanal, 1901, (Meek) ".

82. *Endotricha dyschroa* Turner

E. dyschroa Turner, 1918 : 284. (Norfolk I.) Holotype ♂ in South Australian Mus., Adelaide, Australia.

I have examined a slide of the genitalia and a colour photograph of the type. The specimen is very badly damaged and I am uncertain of the affinities of this species. No figure of the moth is given.

Genitalia. ♂, Pl. 25, fig. 228.

Material examined. Norfolk I. (N.N.W. of New Zealand), 1 ♂ (in South Australian Mus.).

83. *Endotricha lobibasalis* Hampson

(Pl. 10, fig. 141)

E. lobibasalis Hampson, 1906 : 208. (Australia.) Holotype ♂ in B.M.

Genitalia. ♂, Pl. 25, fig. 229. ♀ unknown.

Material examined. Australia, 2 ♂ ; Dampier I., 1 ♂ ; New Guinea, 1 ♂.

84. *Endotricha chionosema* Hampson

(Pl. 10, figs. 142 and 145)

E. chionosema Hampson, 1916 : 357. (Goodenough I.) Holotype ♂ in B.M.

In the forewing of this species vein *Sc* clearly anastomoses with vein R_1 one-third of the way from the apex of the wing, a character also found in *E. coreacealis* Pag.

Genitalia. ♂, Pl. 25, fig. 230. ♀, Pl. 36, fig. 307.

MATERIAL EXAMINED. GOODENOUGH I., 3 ♂, 3 ♀; DAMPIER I., 2 ♂.

85. *Endotricha peterella* sp. n.

(Pl. 10, figs. 136 and 139)

♂. Wing 8 mm. Head and thorax grey brown irrorate with red scales.

Forewing. General colour light grey brown, basal area dark brown. Costal margin black and yellowish brown alternate patches. Subcostal area reddish. Fringe white and black alternately. Terminal line black, interrupted. Subterminal area reddish brown near apex, lighter posteriorly. Subterminal line conspicuous, sinuous, edged with black. Discal spot black, black scales in patch from discal spot across to wing margin between R_5 and M_1. Scattered black scales outlining median yellowish brown area. Most of subterminal area black posteriorly, remaining part grey brown. Median area edged on antemedial side by conspicuous broad black patch of scales. Basal area black.

Hindwing. Mostly light coloured, black fringe and terminal line. Black ante- and postmedial fascia.

Underside. Paler forewings, few black scales.

Hindwing. Light coloured except for conspicuous median black wing fascia and a double black line of scales postmedially.

♀. General colour dark reddish purple. Median area reddish, irrorate with black scales. Subterminal line conspicuous. Underside dark red-brown, heavily irrorate with black scales.

Genitalia. ♂, Pl. 25, fig. 231. ♀, Pl. 34, fig. 294.

MATERIAL EXAMINED. Holotype ♂, " CAROLINE IS., Palau I., Koror I., Limestone ridge, at light, v.57 (Sabrosky) ", in U.S. Nat. Mus.

Paratypes. CAROLINE IS., 1 ♂, 3 ♀, (data as type).

I am uncertain of the relationship of this species. The cornutus has some similarity with *E. pyrrhaema* Hamps. but *E. peterella* has a weakly developed gnathus whereas this is absent in *E. pyrrhaema* Hamps.

86. *Endotricha pyrrhaema* Hampson

(Pl. 10, fig. 148)

E. pyrrhaema Hampson, 1916 : 364. (Amboina.) Holotype ♂ in B.M.

This species appears to lack a gnathus. The gnathus arms are well developed but it is impossible to separate the gnathus from the surrounding membranes.

Genitalia. ♂, Pl. fig. 26, 237. ♀, Pl. 36, fig. 308.

MATERIAL EXAMINED. NEW GUINEA, 2 ♀; AMBOINA, 4 ♂.

THE *PYRRHOCOSMA* SPECIES GROUP

The next five species have extremely similar genitalia but they are all distinct from one another in external appearance. I prefer to regard them as a super-species complex rather than subspecies of one species. All the species in this group lack a gnathus but the gnathus arms are well developed.

87. *Endotricha pyrrhocosma* Turner

(Pl. 10, fig. 144)

E. pyrrhocosma Turner, 1911 : 121. (Australia.) Holotype ♂ in C.S.I.R.O., Canberra, Australia.

Genitalia. ♂, Pl. 27, fig. 240 and Pl. 28, fig. 245 (cornutus). ♀ unknown.

MATERIAL EXAMINED. AUSTRALIA, 4 ♂; MANOVOLKA I., 1 ♂; WOODLARK I., 1 ♂.

88. *Endotricha thermidora* Hampson

(Pl. 10, figs. 143 and 146)

E. thermidora Hampson, 1916 : 359. (New Guinea.) Holotype ♂ in B.M.

This species is larger than *E. pyrrhocosma* Turner (wing 10 mm.; *pyrrhocosma*, wing 8 mm.) and lacks the pronounced reddish-brown basal area to the hind wing. The cornutus in the aedeagus is also a slightly different shape.

Genitalia. ♂, Pl. 27, fig. 238 and Pl. 28, fig. 243 (cornutus). ♀, Pl. 36, fig. 309.

MATERIAL EXAMINED. NEW GUINEA, 3 ♂; ADMIRALTY IS., 1 ♂; YAMMA I., 1 ♂; SOLOMON IS., 2 ♂; NEW HANNOVER, 6 ♂, 3 ♀; DAMPIER I., 3 ♂, 2 ♀; NEW BRITAIN, 2 ♂, 1 ♀; SUDEST I., 2 ♂.

89. *Endotricha bradleyi* Whalley

(Pl. 10, fig. 147)

E. bradleyi Whalley, 1962 : 105. (Rennel I.) Holotype ♂ in B.M.

The females are slightly smaller than the males and generally darker.

Genitalia. Pl. 27, fig. 242 and Pl. 28, fig. 247 (cornutus). ♀, Pl. 34, fig. 290.

MATERIAL EXAMINED. SOLOMON IS. (Rennel I.), 3 ♂, 2 ♀.

90. *Endotricha mariana* sp. n.

(Pl. 10, fig. 151)

♂. Wing 8·3 mm. Head reddish brown, irrorate with black. Thorax reddish brown, irrorate with black, tegulae yellowish brown.

Forewing. General colour reddish brown, with white median area, prominent discal spot. Costal margin brown with yellowish marks. Cilia white. Terminal line black, interrupted. Indistinct subterminal line. Terminal area blackish, irrorate with red scales. Subterminal area black with a few red scales. Discal spot oval, black. Median area white, narrowing posteriorly. Basal and sub-basal area black, irrorate with red and yellow scales.

Hindwing. Similar, greyer. Prominent sinuous median white line. Basal area white, irrorate with a few black and red scales.

Underside. Pale reddish brown, discal spot prominent. Median area of forewing not clearly demarcated, on hind wing median area edged with black fascia.

♀. Unknown.

Genitalia. ♂, Pl. 27, fig. 241 and Pl. 28, fig. 246 (cornutus).

This has the typical ♂ genitalia of the *pyrrhocosma* group. It differs from the other members of the group in the upturned (instead of down-turned) sacculus process and there is a slight difference in the shape of the cornutus.

MATERIAL EXAMINED. Holotype ♂, MARIANAS IS., " GUAM, viii.45 ", in U.S. Nat. Mus.

Paratypes. MARIANAS IS., 1 ♂, " Pt. Oca, vi.45 ".

91. *Endotricha separata* sp. n.

(Pl. 10, figs. 149 and 150)

♂. Wing 6·9 mm. Head and thorax yellowish brown with a few reddish brown and black scales intermixed.

Forewing. General colour reddish brown, yellowish brown on hind margin. Costal margin black and yellowish brown alternate patches. Fringe chestnut. Terminal area purplish overlaid with dark red scales. Subterminal line sinuous, yellowish. Median area yellowish, enlarging on posterior margin. Discal spot conspicuous. Rest of wing chestnut brown.

Hindwing. Marginal area reddish brown with black scales, area enlarging near tornus. Basal area reddish brown. Medial area yellowish brown, narrowing posteriorly.

Underside. Reddish costal area on forewing, discal spot conspicuous. Anal area with grey scales.

Hindwing. Reddish on anterior margin, several transverse fasciae of red and black scales from anterior margin to tornus.

♀. Dark red forewing, discal spot black. Basal area brown. Hindwings with median area narrow, reddish, no large yellow area as in male. Basal and terminal areas heavily irrorate with black scales. Underside, as male.

Genitalia. ♂, Pl. 27, fig. 239 and Pl. 28, fig. 244 (cornutus). ♀, Pl. 34, fig. 293.

This species has similar genitalia to the Australian *E. pyrrhocosma* Turner, but is distinct externally.

MATERIAL EXAMINED. Holotype ♂, CAROLINE IS., " Yap I., Weloy, at light, (Sabrosky) " in U.S. Nat. Mus.

Paratypes. CAROLINE IS. 2 ♂, " Gagil Gachapar, at light, vi.57 (Sabrosky) " ; 5 ♂, 2 ♀, " Weloy, vi.57, (Sabrosky) " ; 2 ♀, " Kolonia, vi.57, (Sabrosky) ".

SPECIES INDETERMINATAE

It has not been possible to identify the following species :—

Endotricha centripunctalis Gaede

E. centripunctalis Gaede, 1916 : 128. (Cameroons.) Type lost.

The type of this species, formerly in the Berlin Museum, was destroyed in the war. It has not been possible to identify this species from the description.

Endotricha wammeralis Pagenstecher

E. wammeralis Pagenstecher, 1886 : 168. (Aru.) Type not traced.

I have been unable to identify this species from the original description or to trace the type.

SPECIES DESCRIBED IN, OR SUBSEQUENTLY PLACED IN, *ENDOTRICHA*, WHICH HAVE BEEN TRANSFERRED TO OTHER GENERA

(* Type examined)

E. annuligera Butler, 1886 : 427.* This is a junior synonym of *Lamprosema mesochlora* Meyrick (Pyraustinae), see Hampson, 1898 : 695.

E. bicoloralis Leech, 1889 : 65.* This is in the genus *Stemmatophora* Guenée (Pyralini), see Hampson, 1896 : 515.

E. heliopa Meyrick, 1884 : 78.* This is a synonym of *Endosimilis stilbealis* Walk., see Whalley, 1961 : 734.

E. julialis Walker, 1859, 17 : 389.* This is a junior synonym of *Hapalia bicoloralis* Guenée (Pyraustinae), see Hampson, 1899 : 245.

E. pulchrinalis Guenée, 1854 : 220. This is in the genus *Persicoptera* Meyrick (Endotrichini), see Hampson, 1896*b* : 487.

E. pulverealis Hampson, 1916 : 363.* This is in the genus *Bostra* Walker (Pyralini), see Meyrick, 1884 : 283.

E. pyrocaustalis Lower, 1903 : 60. This is a junior synonym of *Endosimilis stilbealis* Walker (Endotrichini), see Whalley, 1961 : 734.

E. rhodophilalis Walker, 1865, 34 : 1311.* This is a junior synonym of *Hyalobathra filialis* Guenée (Pyraustinae), see Hampson, 1899 : 189.

E. ruficosta Wileman, 1917 : 175.* This is a junior synonym of *Herculia nanalis* Wileman (Pyralini), see Shibuya, 1928 : 22.

E. stenialis Warren, 1891 : 69.* This is a junior synonym of *Nymphula titanalis* Walker (Hydrocampini), see Hampson, 1897 : 144.

E. stilbealis (Walker), 1859 : 913.* This was transferred to the genus *Endosimilis* Whalley (Endotrichini), see Whalley, 1961 : 734.

E. subulalis Guenée, 1854 : 221. This is in the genus *Nacoleia* Walker (Pyraustinae), see Hampson, 1898 : 694.

E. venustalis (Warren), 1896*b* : 464.* This is a junior synonym of *Trichophysetis rufoterminalis* Christoph (Pyraustinae). This species was originally described in the genus *Cangetta* Moore, but was transferred to the genus *Endotricha* Zeller by Hampson, 1896*b* : 485.

SPECIES DESCRIBED IN *ENDOTRICHA* WHICH ARE TRANSFERRED TO OTHER GENERA IN THIS WORK

(* type or paratypes examined, type locality in brackets after reference)

E. aglaopa Meyrick, 1887 : 196. (Australia.) This species is transferred to the genus *Persicoptera* Meyrick (**comb. n.**), Endotrichini. I have seen one specimen, probably this species, from the South Australian Museum. The type appears to have been lost.

E. baryptera Lower, 1905 : 180.* (Australia.) This is transferred to the genus *Persicoptera* Meyrick (**comb. n.**), Endotrichini.

E. caustopa Turner, 1905 : 58.* (Australia.) This is transferred to the genus *Gauna* Walker (**comb. n.**), Endotrichini.

E. chagosalis Fletcher, 1910 : 295.* (Chagos Archipelago.) This is transferred to the genus *Sufetula* Walker (**comb. n.**), Pyraustinae.

E. chromatis Caradja, 1925 : 317. (China.) This is a junior synonym of *E. orthotis* Meyrick (**syn. n.**) and should be transferred to the genus *Scenedra* Meyrick (**comb. n.**), Endotrichini. (Syntypic material examined).

E. compsopa Meyrick, 1887 : 195.* (Australia.) This is transferred to the genus *Persicoptera* Meyrick (**comb. n.**), Endotrichini.

E. contestalis Caradja, 1925 : 316. (China.) This is transferred to the genus *Tegulifera* Saalmüller (**comb. n.**), Pyralini. I have seen a photograph of a syntype (in Bucharest) and a drawing of the female genitalia.

E. crobulus Lucas, 1891 : 305. (Australia.) I have been unable to trace the type or any specimen of this species. From the description I am placing it as a synonym of *Endosimilis stilbealis* Walker (**syn. n.**), Endotrichini.

E. cydippealis Walker, 1859, 17 : 391. (Sarawak.) I have been unable to trace the type of this species. From the description I am placing it in the genus *Cirrhochrista* Lederer (**comb. n.**), Pyraustinae.

E. desmotoma Lower, 1903 : 60.* (Australia.) I have examined a slide of the type. This species is transferred to *Persicoptera* Meyrick (**comb. n.**), Endotrichini.

E. dinosticha Turner, 1937 : 69. (Australia.) This is transferred to the genus *Persicoptera* Meyrick (**comb. n.**), Endotrichini.

E. drancesalis Walker, 1859, 19 : 961.* (Borneo.) This is transferred to the genus *Nymphula* Schrank (**comb. n.**), Hydrocampini.

E. duplicilinea Hampson, 1893 : 159.* (Ceylon.) This is transferred to the genus *Gauna* Walker (**comb. n.**), Endotrichini.

E. endotrichalis Warren, 1895 : 468.* (N. India.) This is transferred to the genus *Gauna* Walker (**comb. n.**), Endotrichini.

E. flavirubralis Hampson, 1906 : 211.* (W. Africa). This is transferred to the genus *Tegulifera* Saalmüller (**comb. n.**), Pyralini.

E. hemicneca Turner, 1911 : 123. (Australia.) This is transferred to the genus *Cangetta* Moore (**comb. n.**), Pyraustinae.

E. mediolineata Hampson, 1906 : 212.* (N. India.) The type is badly damaged. I am transferring it to the genus *Gauna* Walker (**comb. n.**), Endotrichini.

E. microphylla Turner, 1937 : 68.* (Australia). This is transferred to the genus *Gauna* Walker (**comb. n.**), Endotrichini.

E. ochrifuscalis Hampson, 1903 : 206.* (N. India). I am uncertain of the exact placing of this species. I am transferring it to the genus *Diathrausta* Lederer (**comb. n.**), Pyraustinae.

E. orthotis Meyrick, 1894 : 476.* (Sambwa.) This is transferred to the genus *Scenedra* Meyrick (**comb. n.**), Endotrichini.

E. penicillalis Christoph, 1881 : 4. (Russia.) This is transferred to the genus *Metasia* Guenée (**comb. n.**), Pyraustinae.

E. phaealis Hampson, 1906 : 210.* (New Guinea.) This is transferred to the genus *Gauna* Walker (**comb. n.**), Endotrichini.

E. psoloptera Turner, 1932 : 191. (Australia.) This is a junior synonym of *Persicoptera baryptera* Lower (p. 446) (**syn. n., comb. n.**).

E. primulina Hampson, 1916 : 362.* (West Africa.) This is transferred to the genus *Hyalobathra* Meyrick (**comb. n.**), Pyraustinae.

E. pulchella Hampson, 1916 : 366.* (Formosa.) This is transferred to the genus *Hendecasis* Hampson (**comb. n.**), Pyraustinae.

E. pygmealis Warren, 1896*a* : 204.* (N. India.) This is transferred to the genus *Trichophysetis* Meyrick (**comb. n.**), Pyraustinae.

E. pyralodes Hampson, 1916 : 367.* (W. Africa.) The exact position of this species is uncertain. I am placing it in the genus *Gauna* Walker (**comb. n.**), Endotrichini, although a new genus near *Gauna* should probably be erected for this species.

E. pyrochroa Hampson, 1916 : 357.* (New Guinea.) This is transferred to the genus *Bostra* Walker (**comb. n.**), Pyralini.

E. rufoterminalis Christoph, 1881 : 34. (Russia.) This is transferred to the genus *Trichophysetis* Meyrick (**comb. n.**), Pyraustinae.

E. scioides Turner, 1932 : 191.* (Australia.) This is transferred to the genus *Persicoptera* Meyrick (**comb. n.**), Endotrichini.

E. serratilis Snellen, 1890 : 570.* (N. India.) I am uncertain of the exact placing of this species. I am placing it in the genus *Gauna* Walker (**comb. n.**), Endotrichini.

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Numbers in bold type are the most important page references.

PLATE I

FIG. 1. *E. flammealis*, ♂, England.
FIG. 2. *E. consocia*, ♂, China.
FIG. 3. *E. theonalis*, ♂, Japan.
FIG. 4. *E. flammealis*, ♂, Algiers.
FIG. 5. *E. consocia*, holotype ♀, Japan.
FIG. 6. *E. theonalis*, ♀, Japan.
FIG. 7. *E. ragonoti*, ♂, Siberia.
FIG. 8. *E. decessalis decessalis*, ♂, Lower Burma.
FIG. 9. *E. decessalis major*, holotype ♂, Borneo.
FIG. 10. *E. occidentalis*, holotype ♂, Australia.
FIG. 11. *E. decessalis decessalis*, ♀, Lower Burma.
FIG. 12. *E. hemicausta*, holotype ♂, Australia.
FIG. 13. *E. melanochroa*, holotype ♀, Australia.
FIG. 14. *E. trichophoralis*, ♀, Burma.
FIG. 15. *E. punicea*, holotype ♂, China.

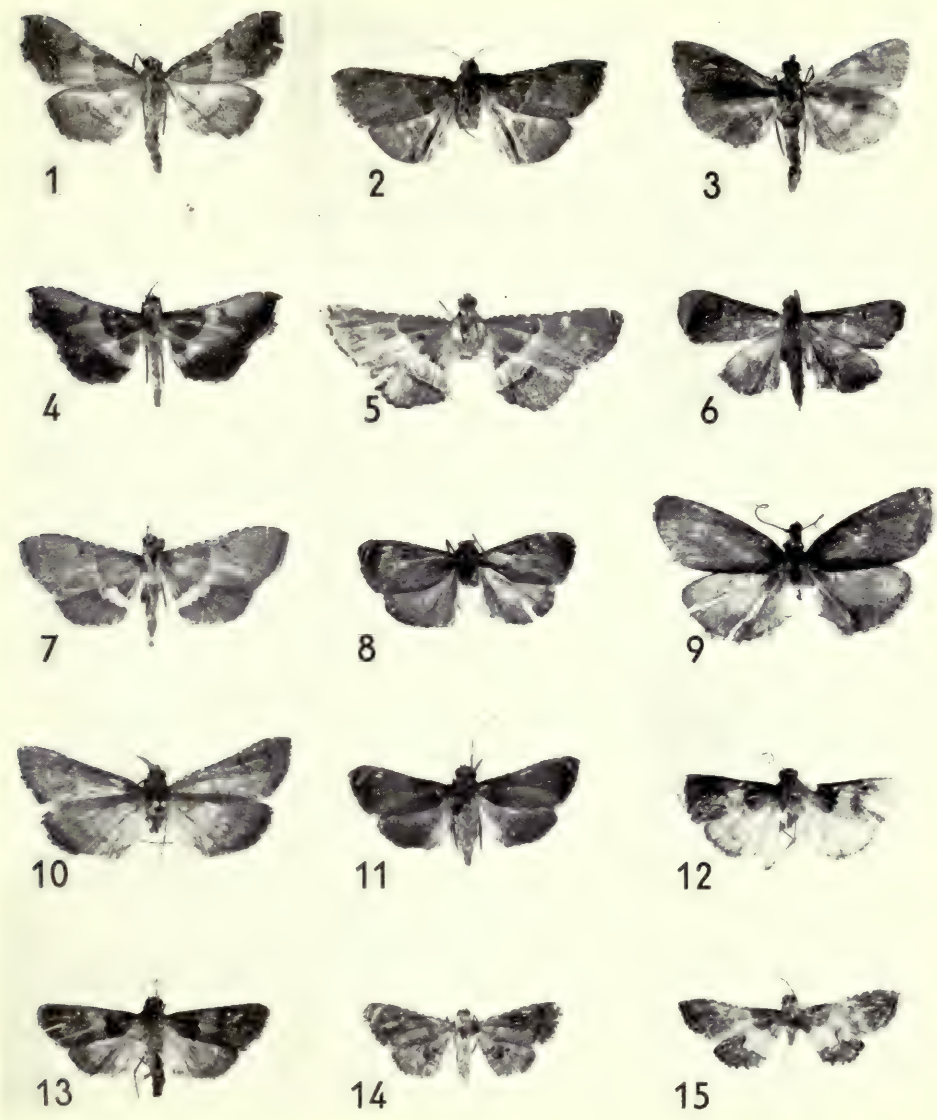
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PLATE 2

FIG. 16. *E. kuznetzovi*, ♂, Manchuria.
FIG. 17. *E. icelusalis*, ♂, China.
FIG. 18. *E. loricata*, ♂, Ceylon.
FIG. 19. *E. kuznetzovi*, ♀, Korea.
FIG. 20. *E. icelusalis*, ♀, China.
FIG. 21. *E. loricata*, holotype, ♀, India.
FIG. 22. *E. puncticostalis*, ♂, Australia.
FIG. 23. *E. luteogrisalis*, holotype ♂, N. India.
FIG. 24. *E. flavofascialis affinialis*, ♂, Japan.
FIG. 25. *E. puncticostalis*, ♀, Australia.
FIG. 26. *E. affinitalis*, lectotype ♀, Sumatra.
FIG. 27. *E. ruminalis*, ♀, Ceylon.
FIG. 28. *E. wilemani*, holotype ♀, Philippines.
FIG. 29. *E. rogenhoferi*, lectotype ♂, Canary Is.
FIG. 30. *E. sondaicalis*, lectotype ♀, Celebes.

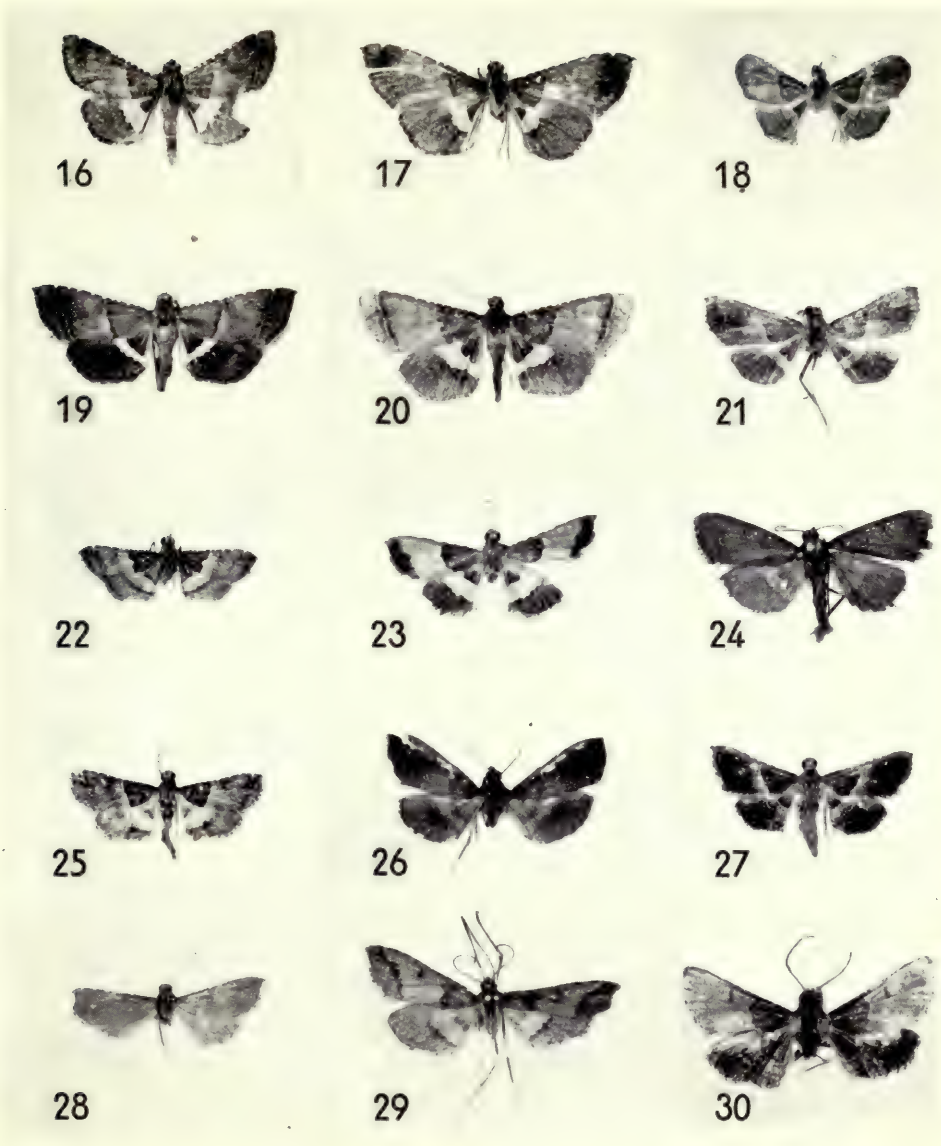
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PLATE 3

Fig. 31. *E. consobrinalis consobrinalis*, ♂, Natal
Fig. 32. *E. consobrinalis consobrinalis*, ♂, Natal.
Fig. 33. *E. consobrinalis meloui*, ♀, Madagascar.
Fig. 34. *E. consobrinalis consobrinalis*, ♀, Jordan.
Fig. 35. *E. ellisoni*, holotype ♂, Abyssinia.
Fig. 36. *E. ellisoni*, ♂, Kenya.
Fig. 37. *E. similata*, ♂, Sikkim.
Fig. 38. *E. ellisoni*, ♀, Abyssinia.
Fig. 39. *E. rosina*, ♂, Congo, Near Lake Kivu, Rwanki.
Fig. 40. *E. similata*, ♀, Darjeeling.
Fig. 41. *E. niveifimbrialis*, ♂, Cameroons.
Fig. 42. *E. rosina*, holotype ♀, Congo.
Fig. 43. *E. vinolentalis*, ♂, W. Africa.
Fig. 44. *E. murecinalis*, ♂, Dorey Is.
Fig. 45. *E. gregalis*, holotype ♂, New Britain.

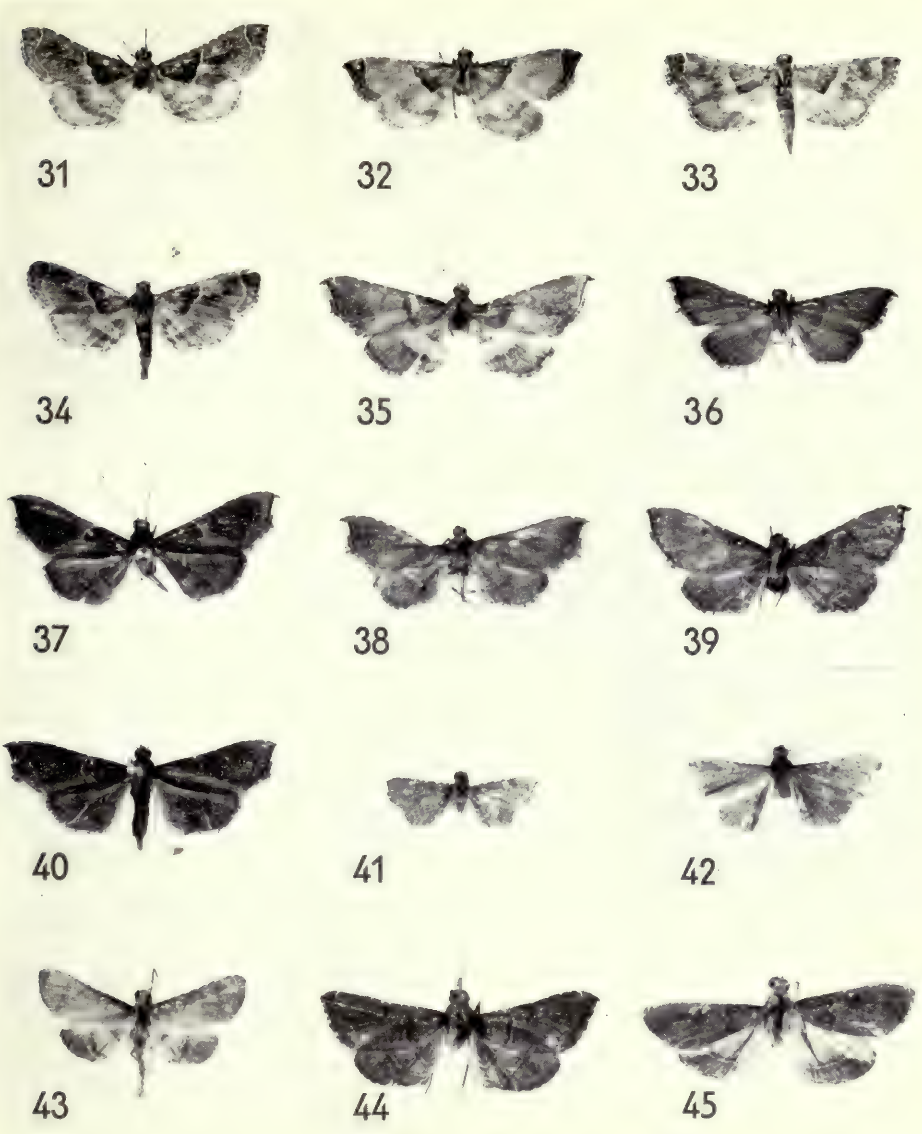
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PLATE 4

FIG. 46. *E. erythralis*, ♂, Madagascar.
FIG. 47. *E. viettealis*, ♂, São Thomé.
FIG. 48. *E. thomealis*, ♂, São Thomé.
FIG. 49. *E. erythralis*, ♀, Madagascar.
FIG. 50. *E. viettealis*, ♀, São Thomé.
FIG. 51. *E. thomealis*, ♀, São Thomé.
FIG. 52. *E. tamsi*, ♂, São Thomé.
FIG. 53. *E. altitudinalis*, ♂, São Thomé.
FIG. 54. *E. portialis*, ♂, Bali.
FIG. 55. *E. ignealis*, ♂, Australia.
FIG. 56. *E. olivacealis*, ♂, Manchuria.
FIG. 57. *E. olivacealis*, ♂, S. India.
FIG. 58. *E. ignealis*, ♀, Australia.
FIG. 59. *E. olivacealis*, ♂, Tibet.
FIG. 60. *E. olivacealis*, ♂, Japan.

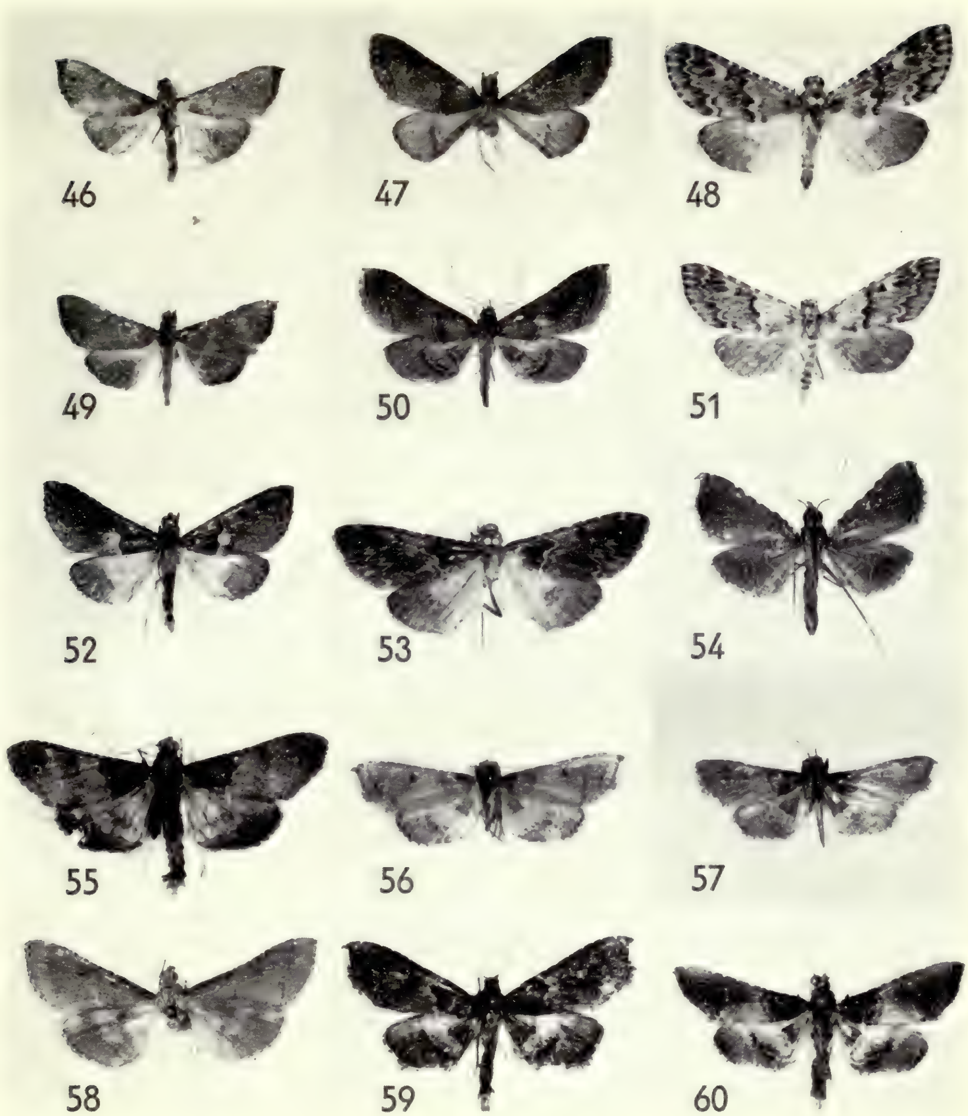
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PLATE 5

FIG. 61. *E. mesenterialis mesenterialis*, ♂, Ceylon.
FIG. 62. *E. mesenterialis obscura*, ♂, Australia.
FIG. 63. *E. mesenterialis mahensis*, ♂, Seychelles.
FIG. 64. *E. mesenterialis mesenterialis*, ♀, Ceylon.
FIG. 65. *E. mesenterialis obscura*, ♀, Australia.
FIG. 66. *E. mesenterialis mahensis*, ♀, Seychelles.
FIG. 67. *E. propinqua*, ♂, New Hebrides.
FIG. 68. *E. plinthopa*, ♂, Samoa.
FIG. 69. *E. argentata*, holotype ♂, Marianas Is.
FIG. 70. *E. propinqua*, ♀, New Hebrides.
FIG. 71. *E. plinthopa*, ♀, Samoa.
FIG. 72. *E. argentata* (orange form) ♀, Marianas Is.
FIG. 73. *E. suavalis*, ♂, Java.
FIG. 74. *E. sexpunctata*, paratype ♂, Marianas Is.
FIG. 75. *E. argentata*, ♀, Marianas Is.

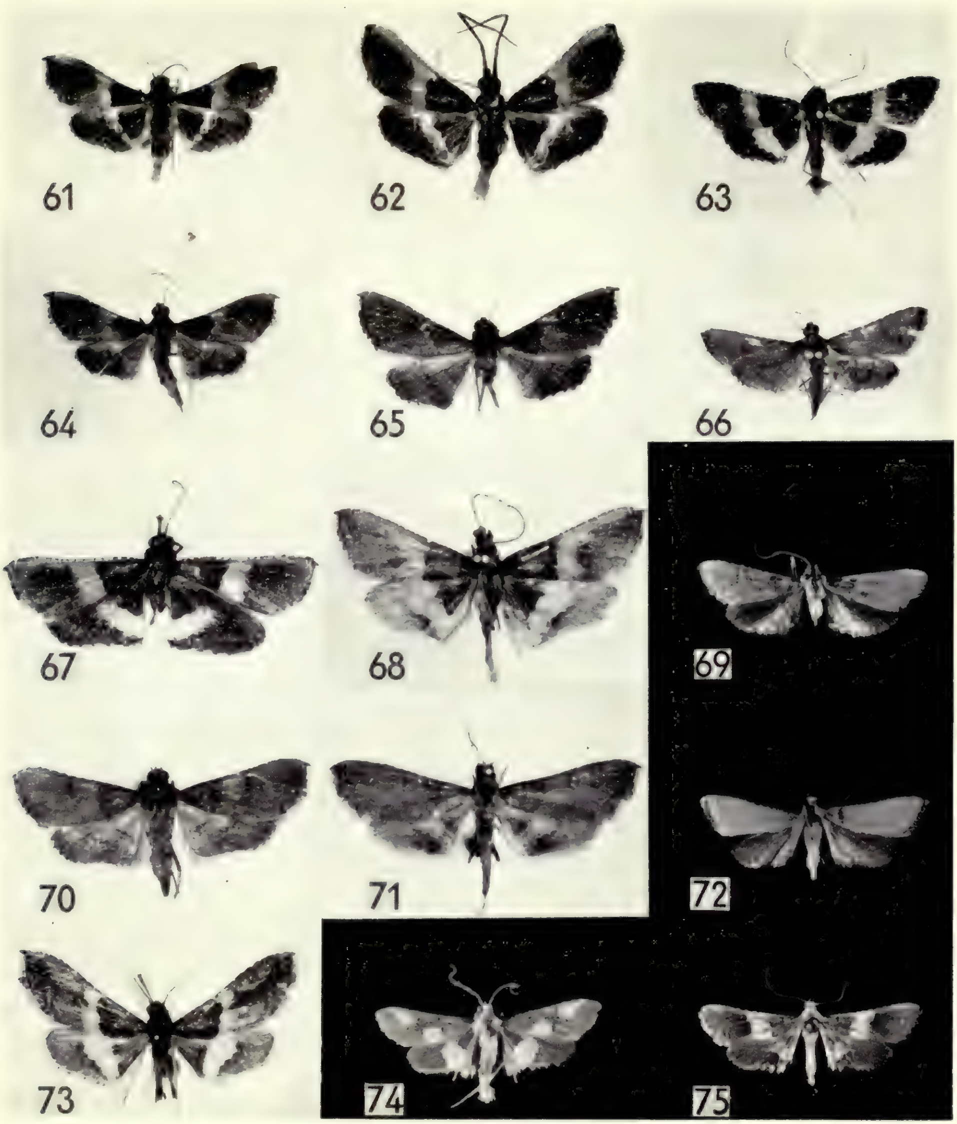
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PLATE 6

FIG. 76. *E. costaemaculalis formosensis*, ♂, Formosa.
FIG. 77. *E. costaemaculalis costaemaculalis*, ♂, Ussuri.
FIG. 78. *E. costaemaculalis fuscifusalis*, ♂, N. India.
FIG. 79. *E. costaemaculalis costaemaculalis*, ♀, Russian Tartary.
FIG. 80. *E. costaemaculalis costaemaculalis*, ♀, Ussuri.
FIG. 81. *E. costaemaculalis fuscifusalis*, ♀, N. India.
FIG. 82. *E. eximia*, ♂, N. India.
FIG. 83. *E. fuscobasalis*, ♂, N. India.
FIG. 84. *E. nigromaculata*, ♂, N. India.
FIG. 85. *E. eximia*, ♀, N. India.
FIG. 86. *E. fuscobasalis*, ♀, N. India.
FIG. 87. *E. nigromaculata*, ♀, N. India.
FIG. 88. *E. ardentalis*, holotype ♀, N. India.
FIG. 89. *E. melanobasis*, ♂, N. India.
FIG. 90. *E. luteobasalis*, lectotype ♂, China.

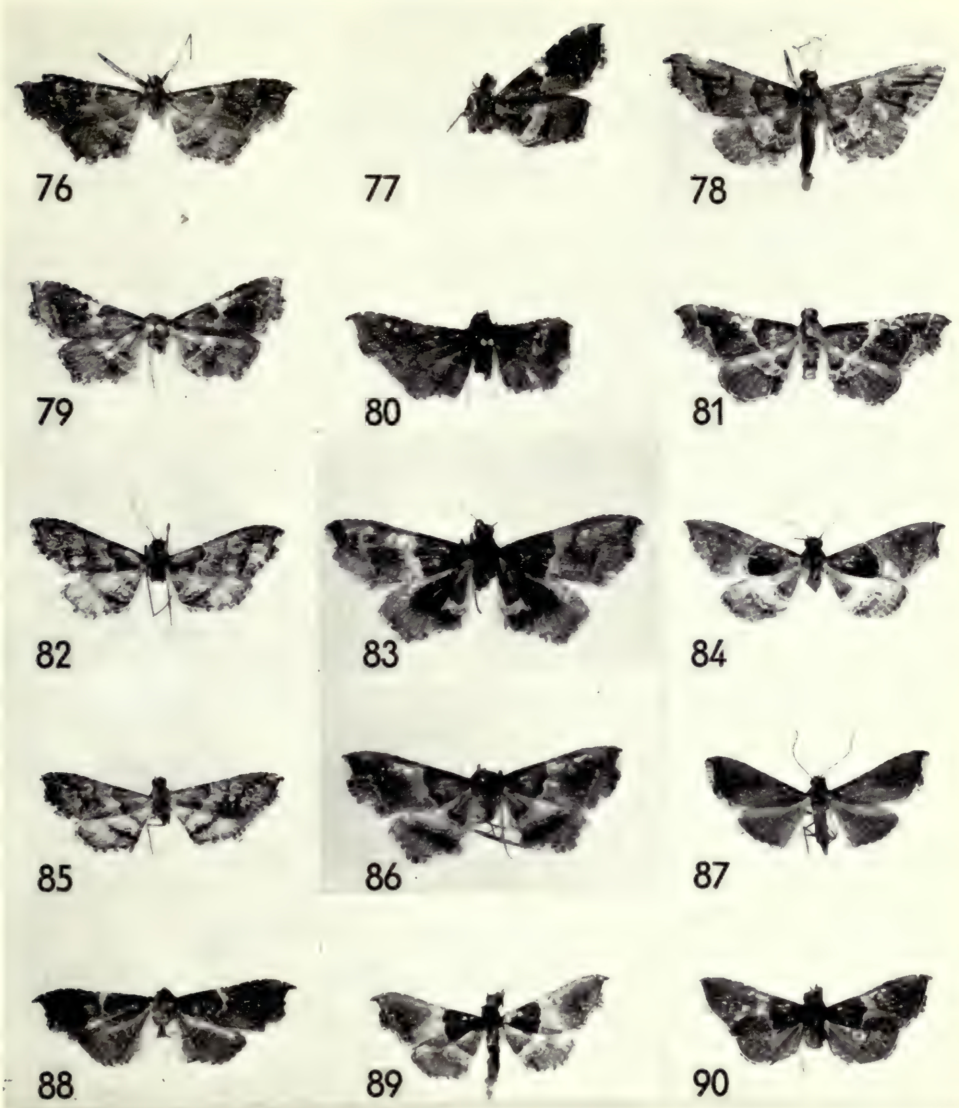
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PLATE 7

FIG. 91. *E. fastigia*, ♂, New Guinea.
FIG. 92. *E. aureorufa*, ♂, New Guinea.
FIG. 93. *E. munroei*, ♂, New Guinea.
FIG. 94. *E. fastigia*, ♀, New Guinea.
FIG. 95. *E. aureorufa*, ♀, New Guinea.
FIG. 96. *E. metacuralis*, ♀, Formosa.
FIG. 97. *E. rhodomicta*, ♂, New Guinea.
FIG. 98. *E. faceta*, ♂, New Guinea.
FIG. 99. *E. hoenei*, holotype ♂, China.
FIG. 100. *E. borneoensis*, ♀, Sarawak.
FIG. 101. *E. faceta*, ♀, New Guinea.
FIG. 102. *E. rufofimbrialis*, ♂, Sarawak.
FIG. 103. *E. persicopa persicopa*, ♂, New Guinea.
FIG. 104. *E. persicopa paliolata*, ♂, Rossell Is.
FIG. 105. *E. rufofimbrialis*, ♀, Sarawak.

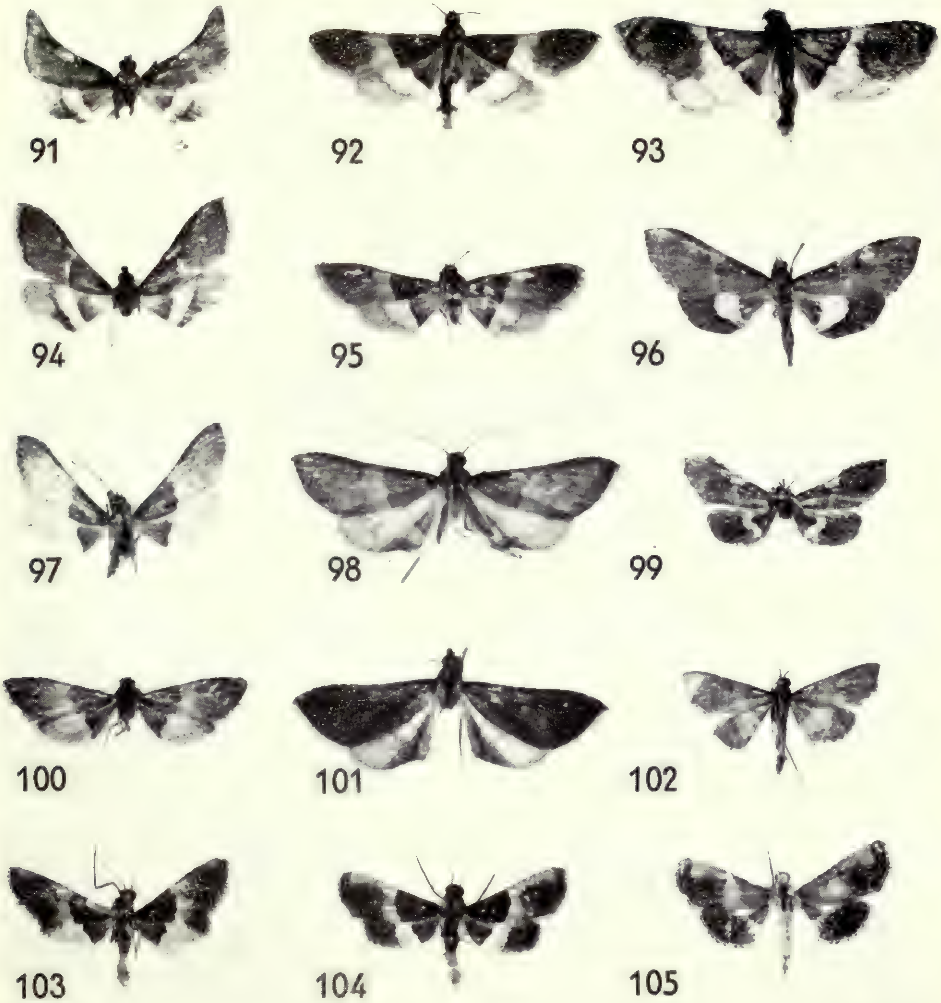
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PLATE 8

FIG. 106. *E. euphiles*, paratype ♂, Australia.
FIG. 107. *E. flavifusalis*, ♂, Rossel I.
FIG. 108. *E. sandaraca*, holotype ♂, Borneo.
FIG. 109. *E. semirubrica*, ♂, Malaya.
FIG. 110. *E. flavifusalis*, ♀, Rossell I.
FIG. 111. *E. sandaraca*, allotype ♀, Borneo.
FIG. 112. *E. denticostalis*, holotype ♂, Borneo.
FIG. 113. *E. capnospila*, ♂, Fiji.
FIG. 114. *E. fuliginosa*, ♂, New Guinea.
FIG. 115. *E. denticostalis*, ♀, Borneo.
FIG. 116. *E. capnospila*, ♀, Fiji.
FIG. 117. *E. fuliginosa*, ♀, New Guinea.
FIG. 118. *E. albicilia*, ♂, Ceylon.
FIG. 119. *E. albicilia*, ♀, Ceylon.
FIG. 120. *E. chionocosma*, holotype ♀, Australia.

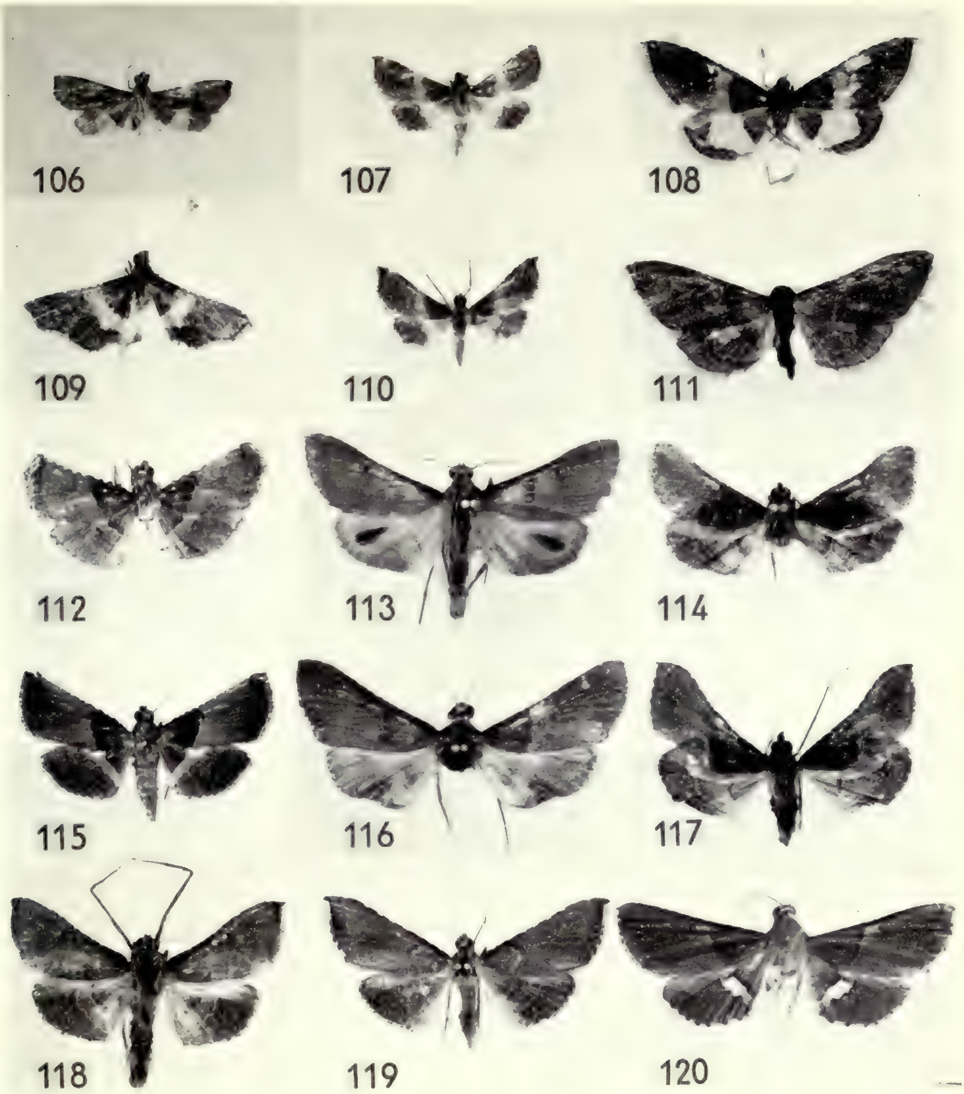
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PLATE 9

FIG. 121. *E. simplex simplex*, holotype ♂, Moluccas.
FIG. 122. *E. variabilis*, holotype ♂, Moluccas.
FIG. 123. *E. dispergens*, ♂, New Guinea.
FIG. 124. *E. simplex simplex*, ♀, Moluccas.
FIG. 125. *E. variabilis*, ♀, Moluccas.
FIG. 126. *E. dispergens*, ♀, Australia.
FIG. 127. *E. simplex rosselli*, ♂, Rossell I.
FIG. 128. *E. conchylaria*, holotype ♂, New Guinea.
FIG. 129. *E. cruenta*, holotype ♂, New Guinea.
FIG. 130. *E. coreacealis*, ♂, Amboina.
FIG. 131. *E. pyrosalis*, ♂, Australia.
FIG. 132. *E. encaustalis*, holotype ♂, New Guinea.
FIG. 133. *E. coreacealis*, ♂, New Guinea.
FIG. 134. *E. pyrosalis*, ♀, Australia.
FIG. 135. *E. approximalis*, ♂, Australia.

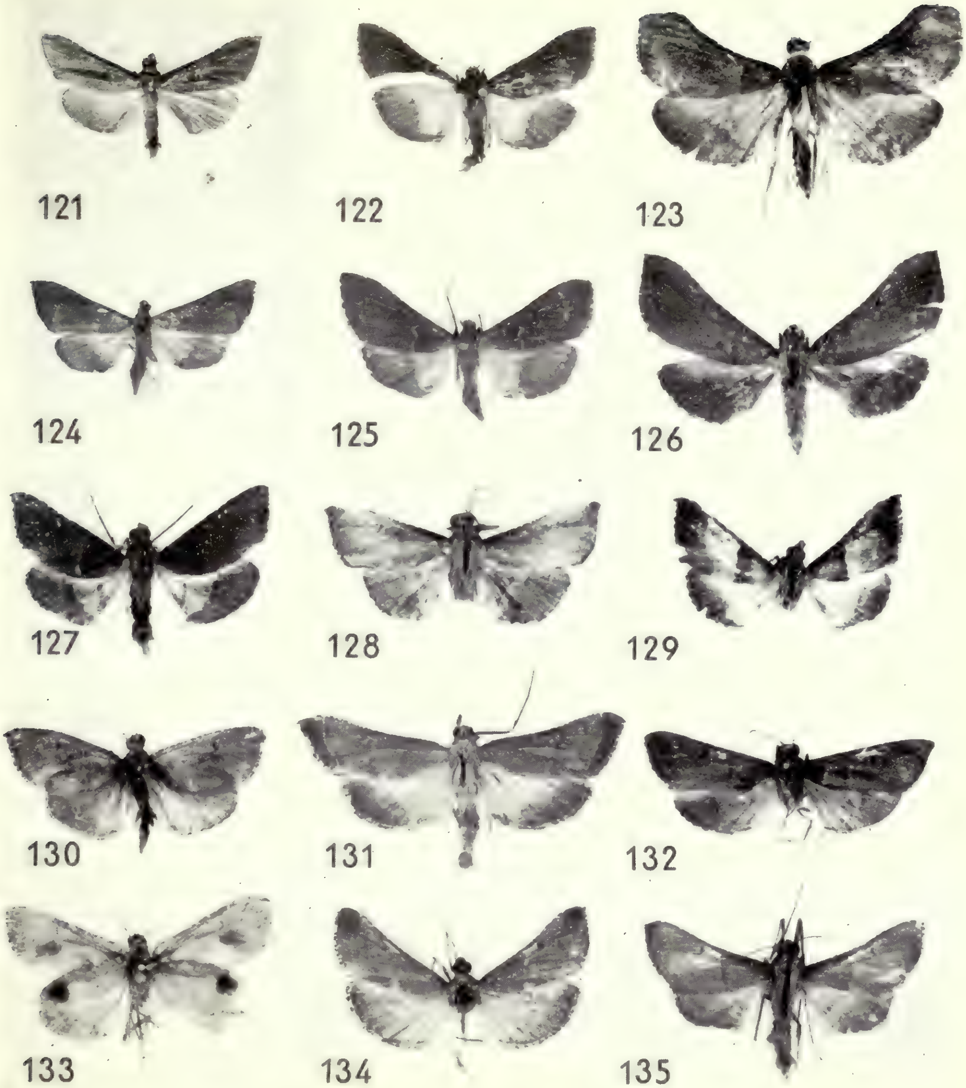
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PLATE 10

FIG. 136. *E. peterella*, holotype ♂, Palau Is.
FIG. 137. *E. psammitis*, ♂, Australia.
FIG. 138. *E. nicobaralis*, ♀, Nicobar Is.
FIG. 139. *E. peterella*, ♀, Palau Is.
FIG. 140. *E. luteopuncta*, ♂, Solomon Is.
FIG. 141. *E. lobibasalis*, holotype ♂, Australia.
FIG. 142. *E. chionosema*, ♂, Goodenough I.
FIG. 143. *E. thermidora*, ♂, Admiralty I.
FIG. 144. *E. pyrrhocosma*, ♂, Australia.
FIG. 145. *E. chionosema*, ♀, Goodenough I.
FIG. 146. *E. thermidora*, ♀, Goodenough I.
FIG. 147. *E. bradleyi*, ♂, Rennel I.
FIG. 148. *E. pyrrhaema*, ♂, Amboina.
FIG. 149. *E. separata*, holotype ♂, Yap. I.
FIG. 150. *E. separata*, paratype ♀, Yap I.
FIG. 151. *E. mariana*, holotype ♂, Marianas I.

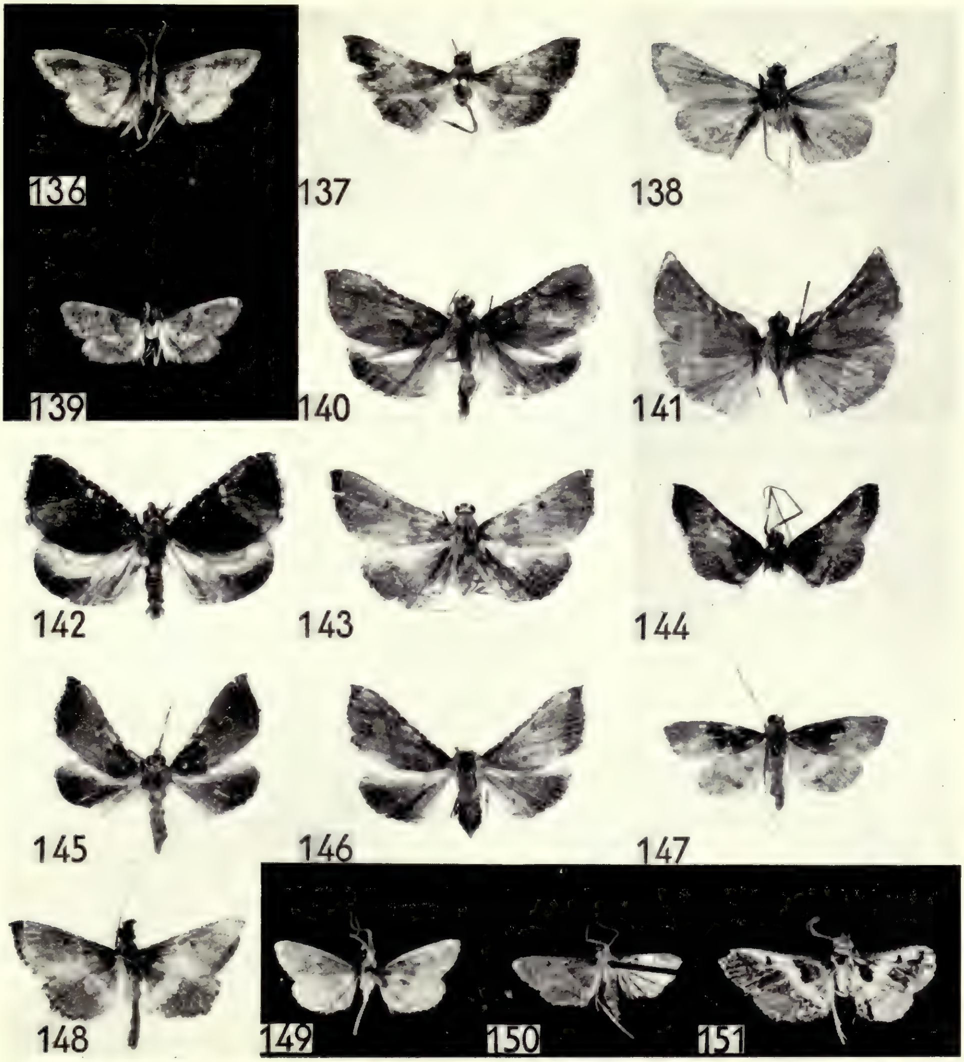
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PLATE 11

Heads

FIG. 152. *E. flammealis*
FIG. 153. *E. portialis*
FIG. 154. *E. olivacealis*
FIG. 155. *E. mesenterialis mesenterialis*

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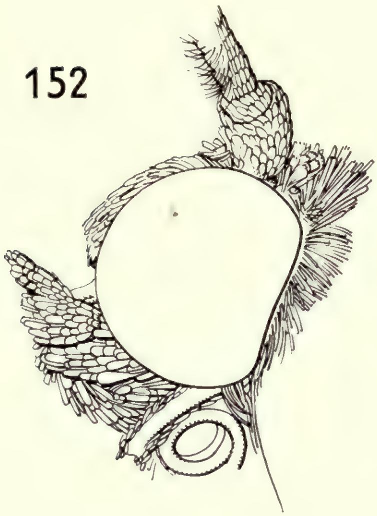

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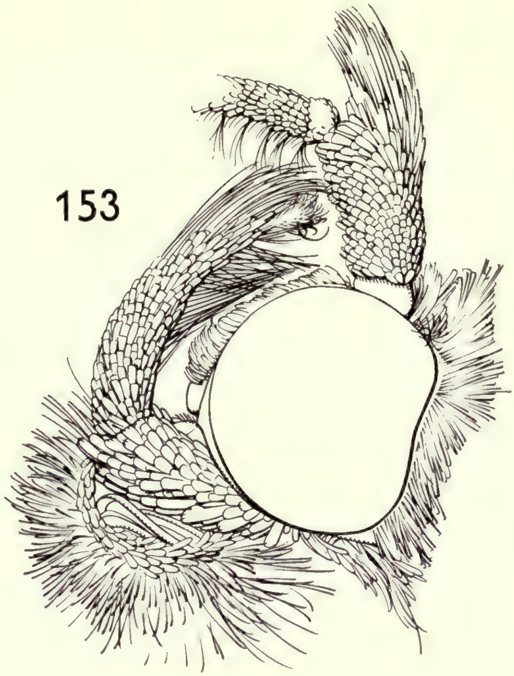

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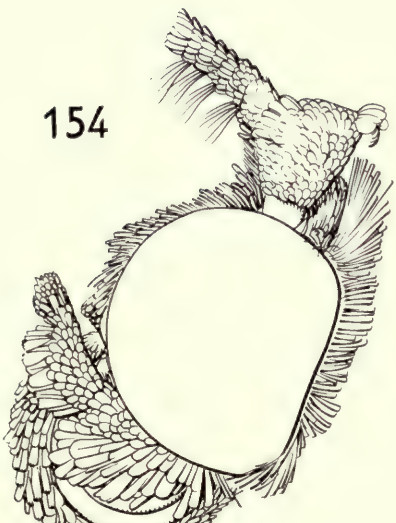

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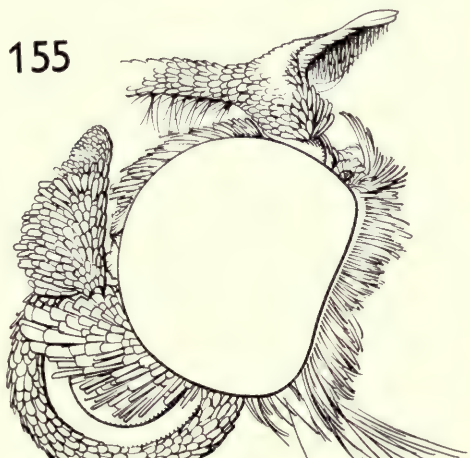
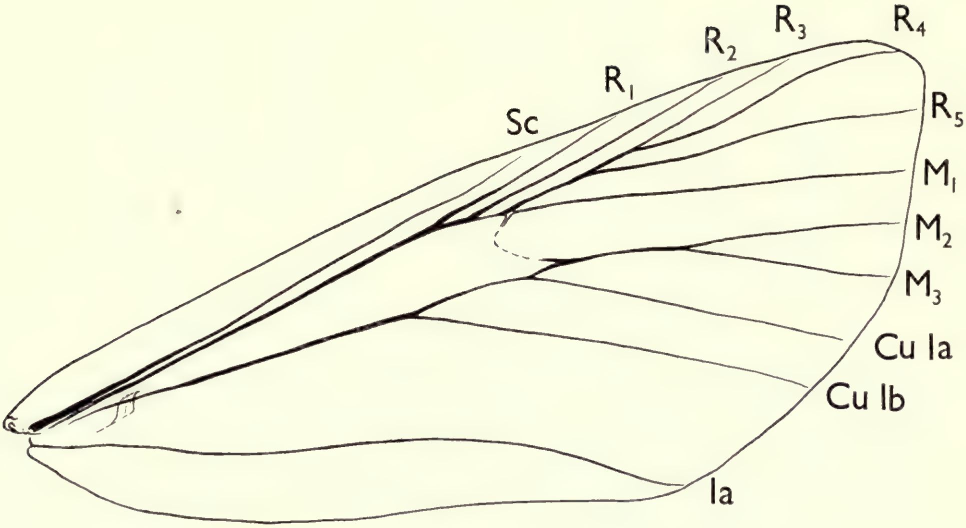


PLATE 12

Wings

FIG. 156. *E. flammealis* ♂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Cu Ib
Ia

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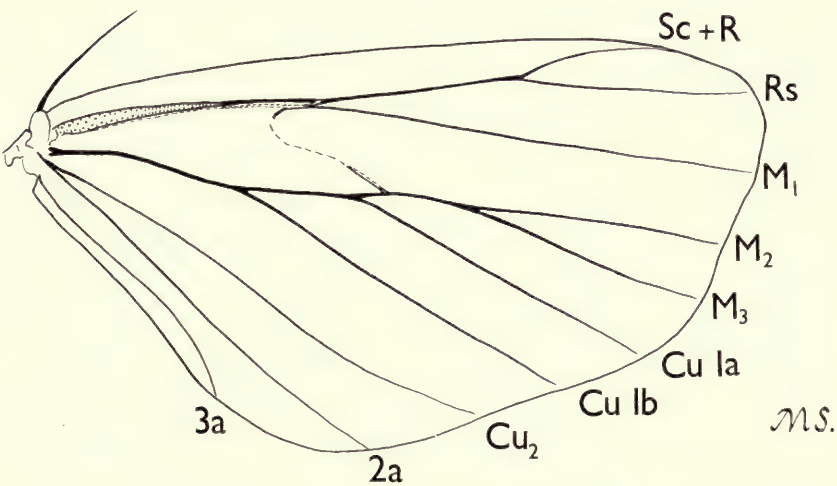
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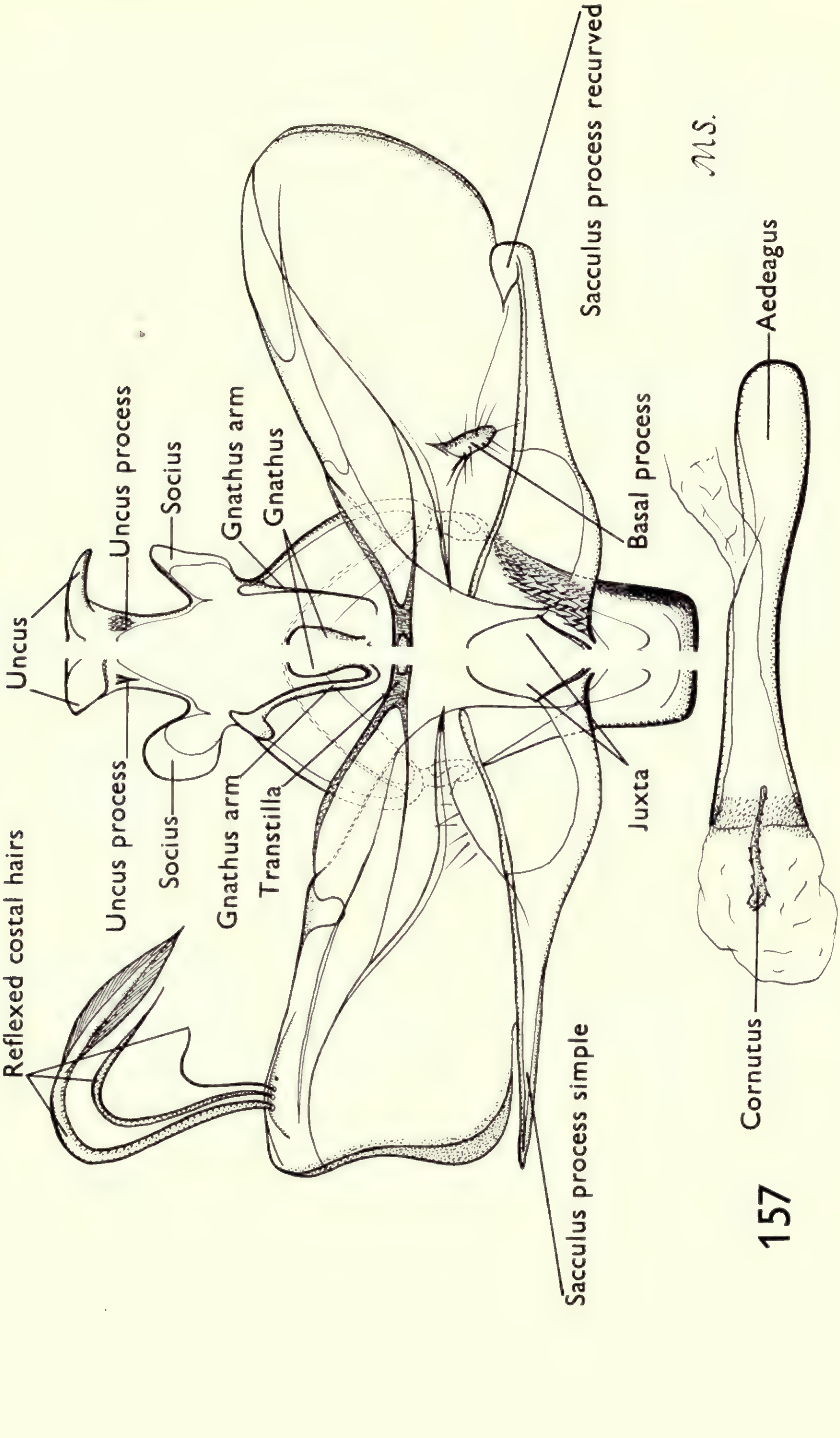
M3
Cu Ia
Cu Ib
Cu2
2a
3a
M.S.

PLATE 13

FIG. 157. Diagram to show main features of ♂ genitalia of *Endotricha*.

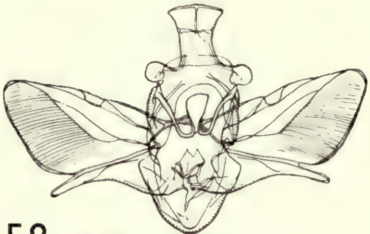

Uncus
Uncus process
Socius
Gnathus arm
Gnathus
Sacculus process recurved
MS.
Aedeagus
Basal process
Reflexed costal hairs
Transtilla
Juxta
Cornutus
Sacculus process simple

157

PLATE 14

♂ genitalia

Fig. 158. *E. flammealis*
Fig. 159. *E. ragonoti*
Fig. 160. *E. consocia*
Fig. 161. *E. decessalis decessalis*
Fig. 162. *E. theonalis*
Fig. 163. *E. occidentalis*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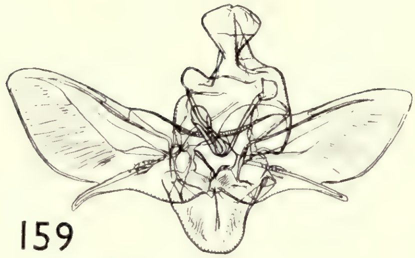
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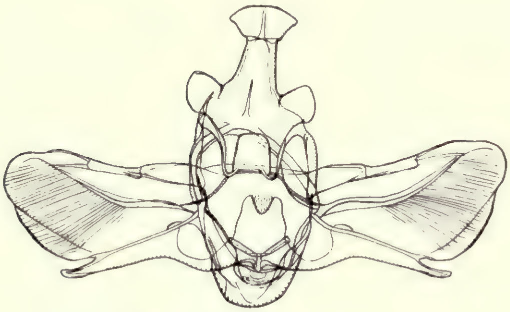
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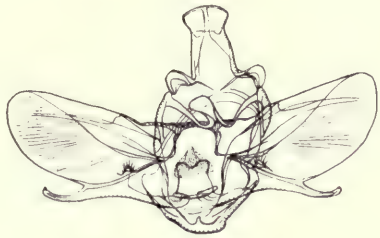
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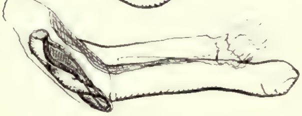


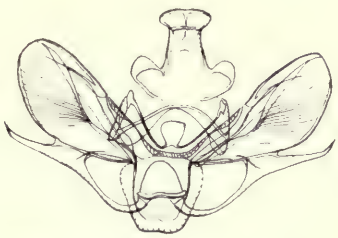
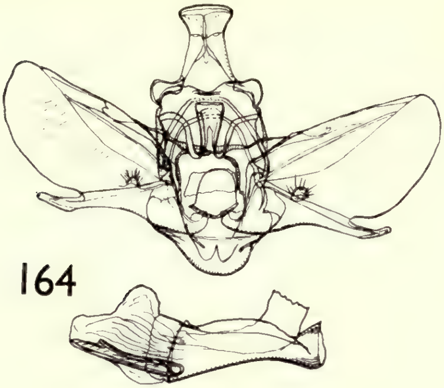

M.S. 163


PLATE 15

♂ genitalia

Fig. 164. *E. hemicausta*
Fig. 165. *E. melanochroa*
Fig. 166. *E. kuznetzovi*
Fig. 167. *E. flavofascialis flavofascialis*
Fig. 168. *E. icelusalis*
Fig. 169. *E. trichophoralis*



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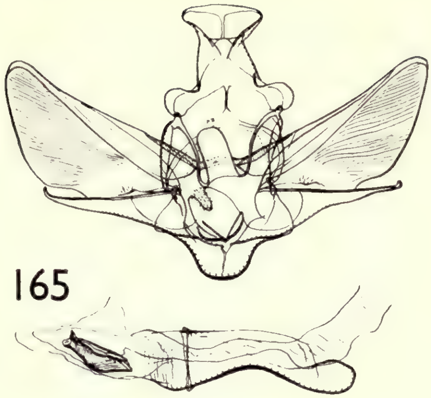

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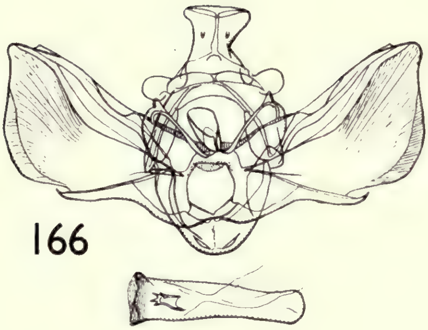

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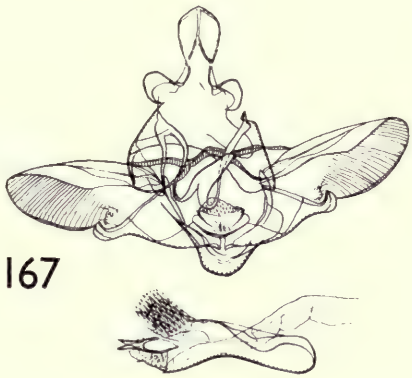

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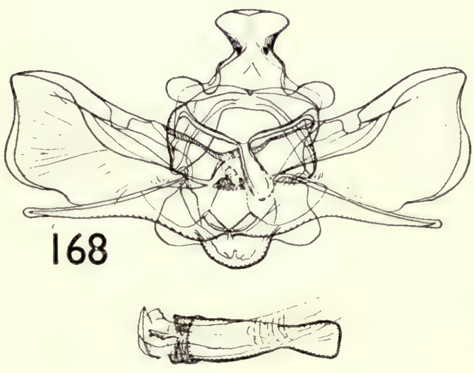
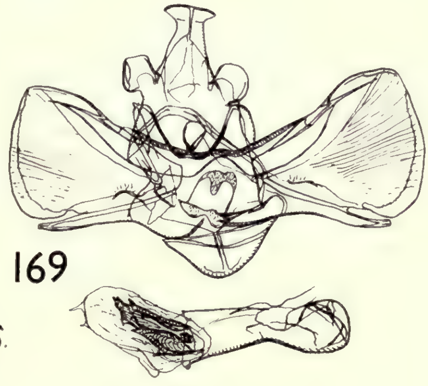


168

MS.

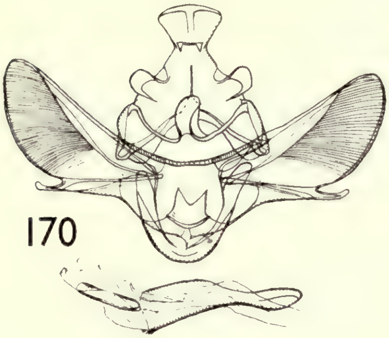


169

PLATE 16

♂ genitalia

FIG. 170. *E. luteogrisalis*
FIG. 171. *E. ruminalis*
FIG. 172. *E. loricata*
FIG. 173. *E. ellisoni*
FIG. 174. *E. rosina*
FIG. 175. *E. vinolentalis*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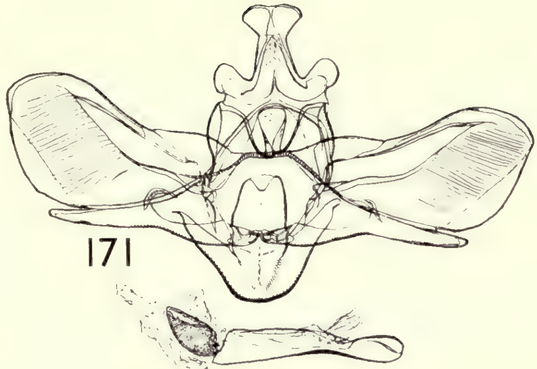
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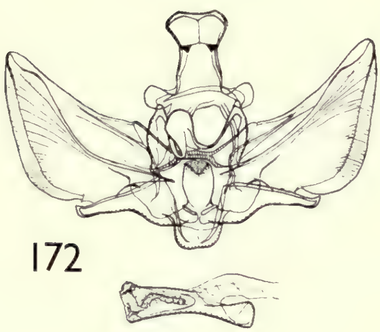
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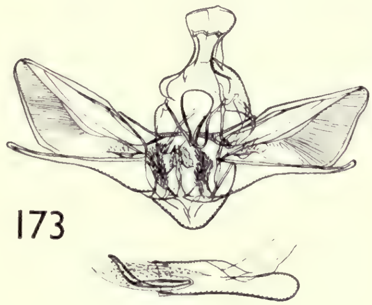
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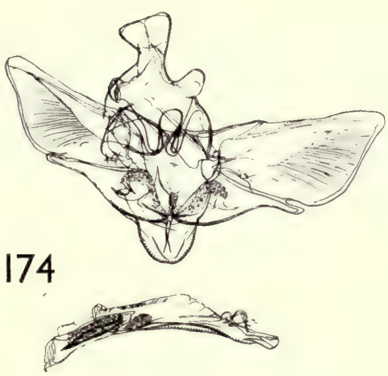
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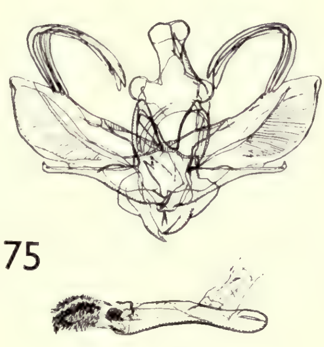
175

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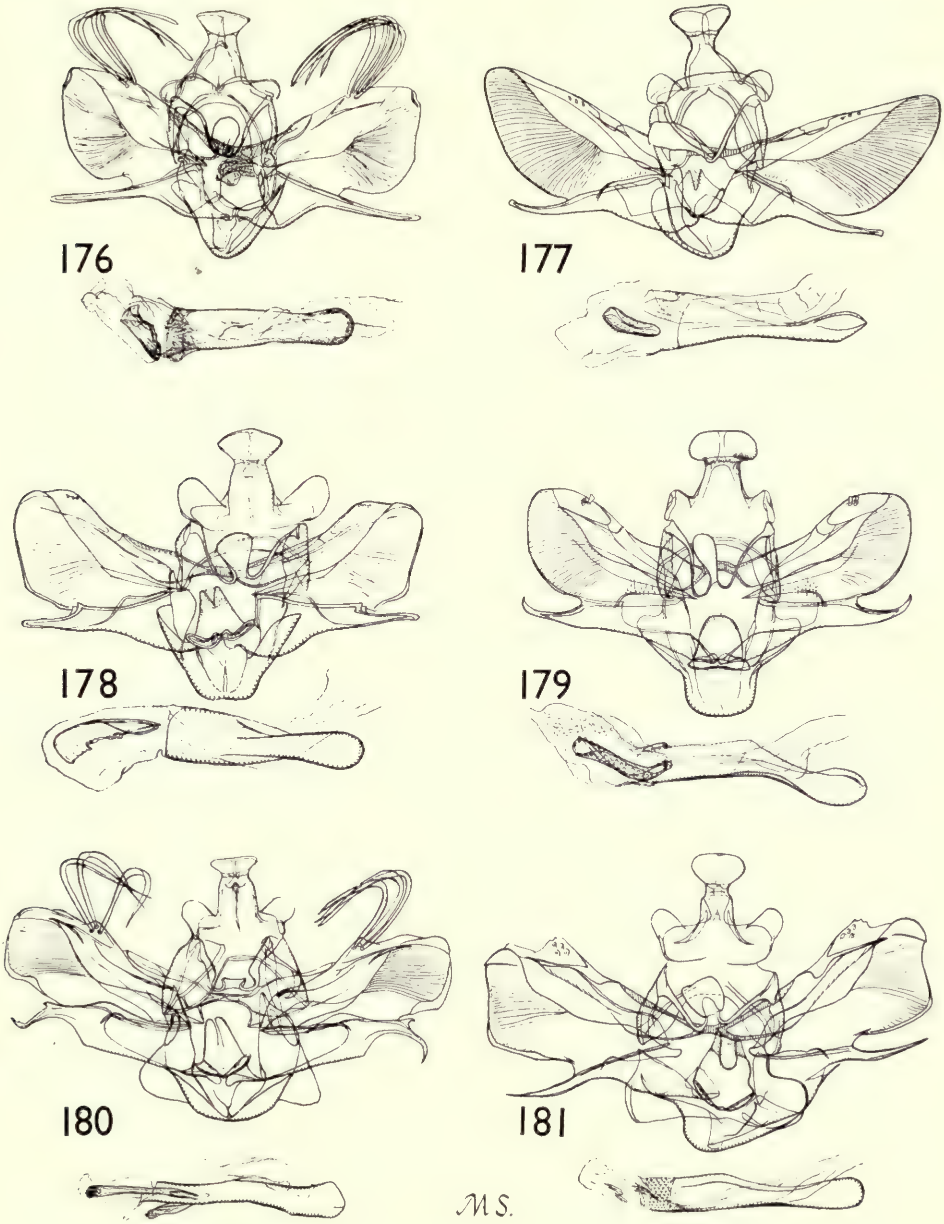
PLATE 17

♂ genitalia

FIG. 176. *E. altitudinalis*
FIG. 177. *E. erythralis*
FIG. 178. *E. murecinalis*
FIG. 179. *E. gregalis*
FIG. 180. *E. portialis*
FIG. 181. *E. ignealis*


176
177
178
179
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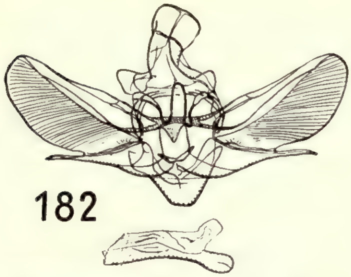
181
M.S.

PLATE 18

♂ genitalia

FIG. 182. *E. consobrinalis consobrinalis*
FIG. 183. *E. puncticostalis*
FIG. 184. *E. niveifimbrialis*
FIG. 185. *E. fastigia*
FIG. 186. *E. punicea*
FIG. 187. *E. rogenhoferi*
FIG. 188. *E. sexpunctata*
FIG. 189. *E. argentata*



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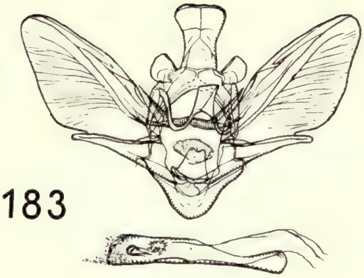

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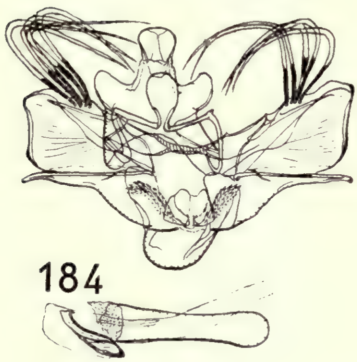

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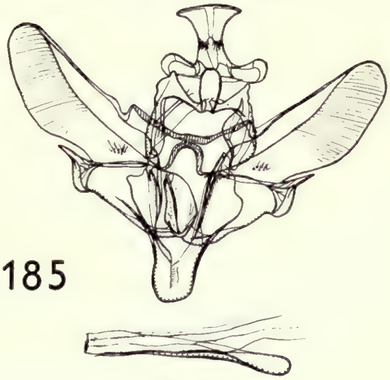

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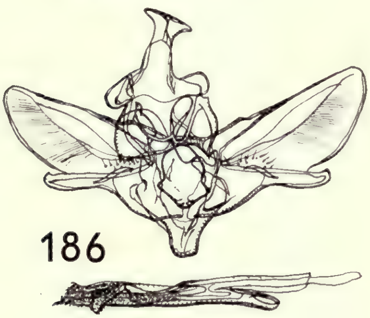

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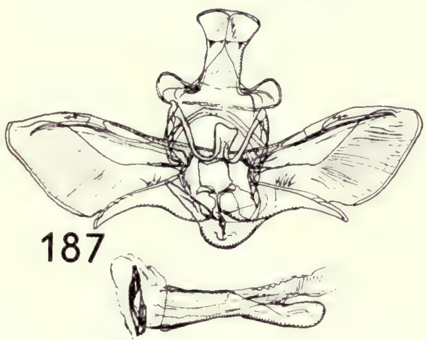

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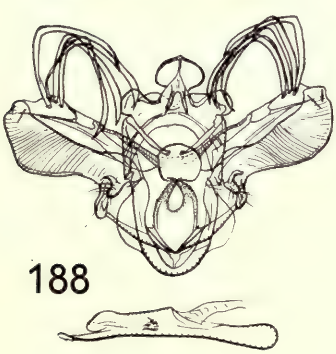

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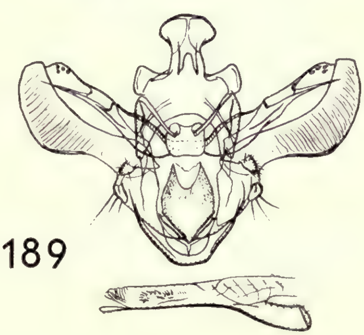
M.S.

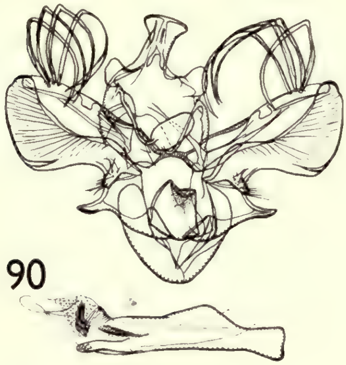


189

PLATE 19

♂ genitalia

FIG. 190. *E. mesenterialis mesenterialis*
FIG. 191. *E. olivacealis*
FIG. 192. *E. plinthopa*
FIG. 193. *E. fuscobasalis*
FIG. 194. *E. hoenei*
FIG. 195. *E. propinqua*



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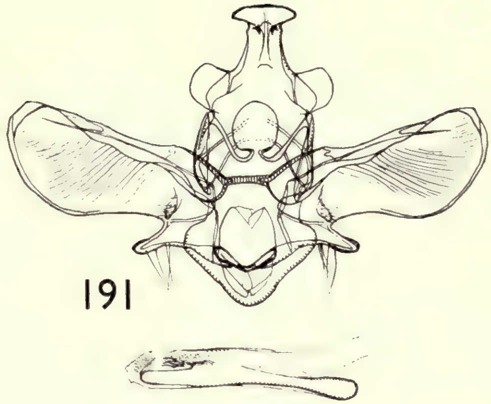

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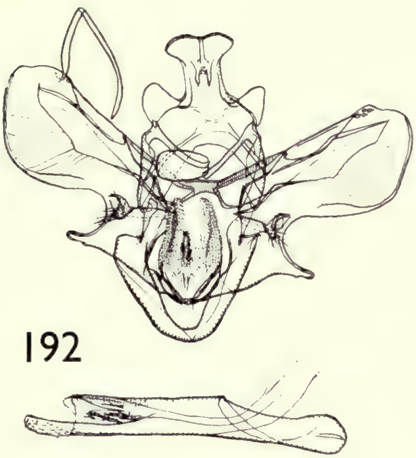

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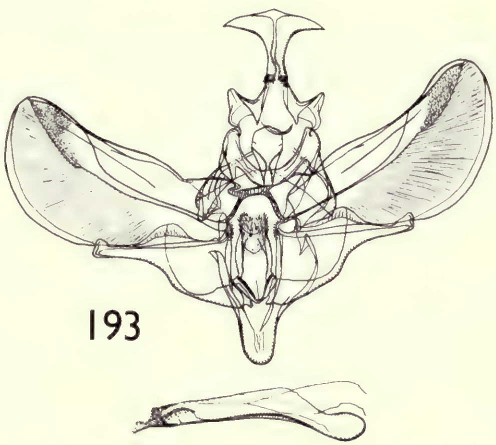

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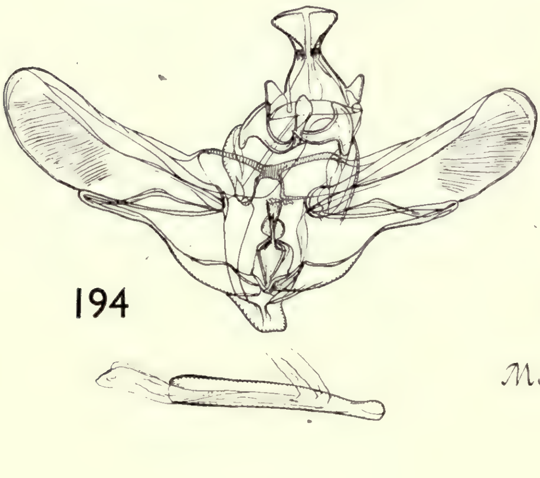

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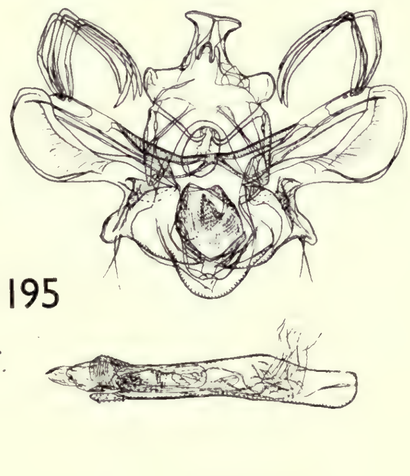

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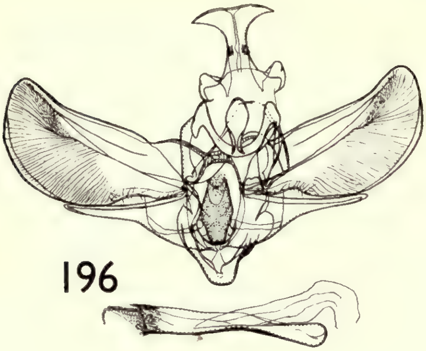
MS.

PLATE 20

♂ genitalia

FIG. 196. *E. costaemaculalis costaemaculalis*
FIG. 197. *E. similata*
FIG. 198. *E. suavalis*
FIG. 199. *E. melanobasis*
FIG. 200. *E. faceta*
FIG. 201. *E. borneoensis*



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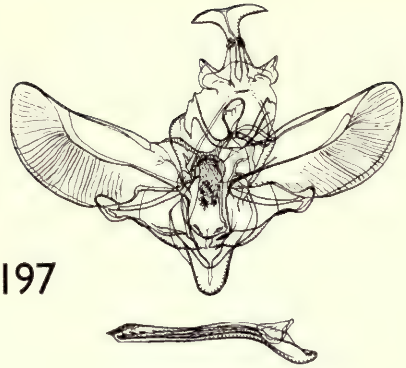

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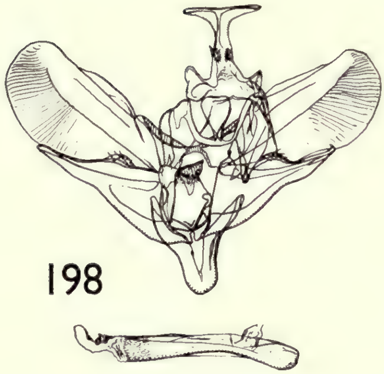

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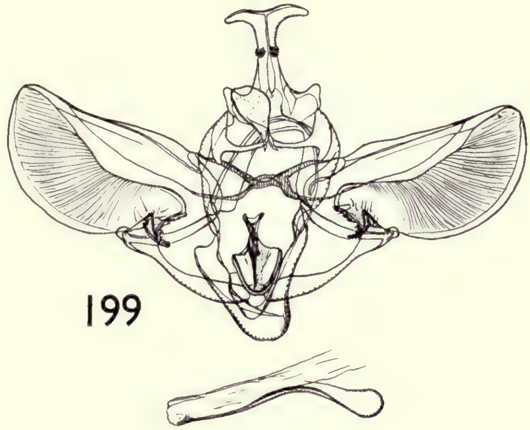

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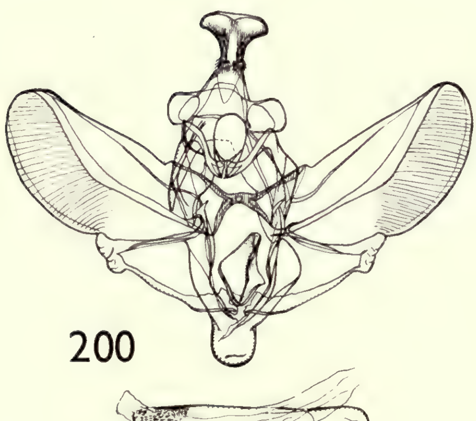

200

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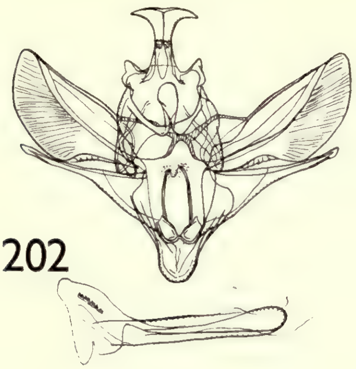
M.S.

PLATE 21

♂ genitalia

Fig. 202. *E. eximia*
Fig. 203. *E. nigromaculata*
Fig. 204. *E. metacuralis*
Fig. 205. *E. euphiles*
Fig. 206. *E. persicopa persicopa*
Fig. 207. *E. persicopa paliolata*



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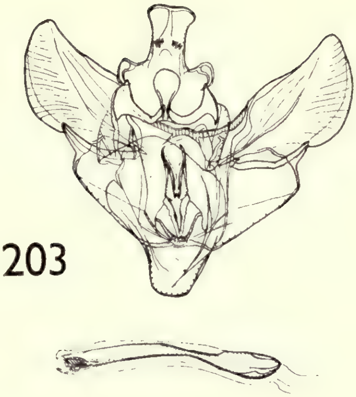

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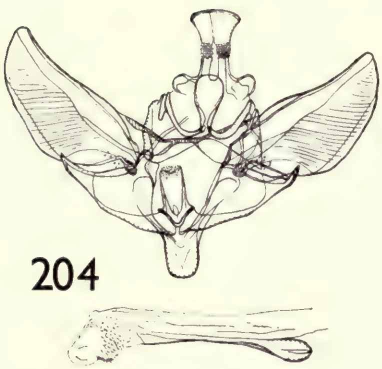

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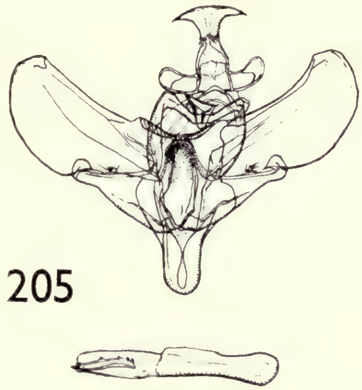

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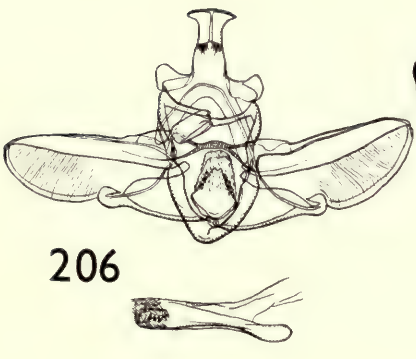

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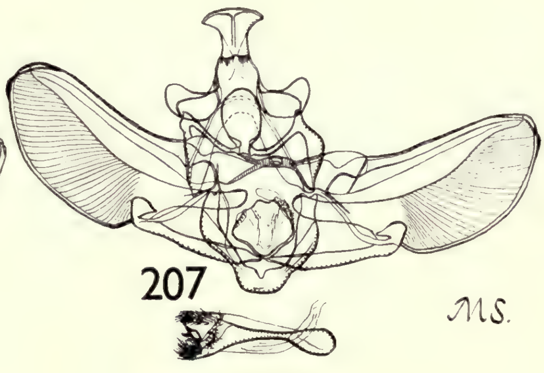

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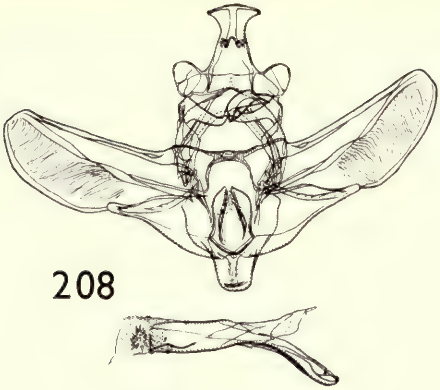
PLATE 22

♂ genitalia

FIG. 208. *E. rhodomicta*
FIG. 209. *E. aureorufa*
FIG. 210. *E. munroei*
FIG. 211. *E. rufofimbrialis*
FIG. 212. *E. luteobasalis*
FIG. 213. *E. sandaraca*



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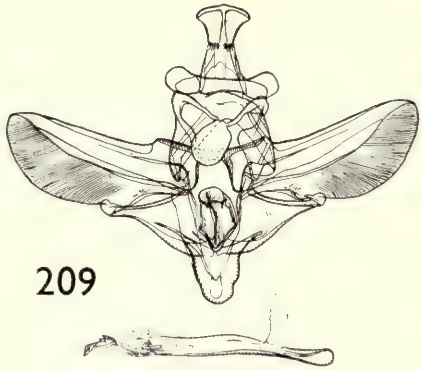

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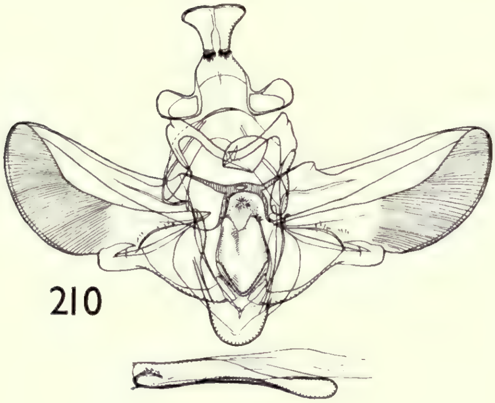

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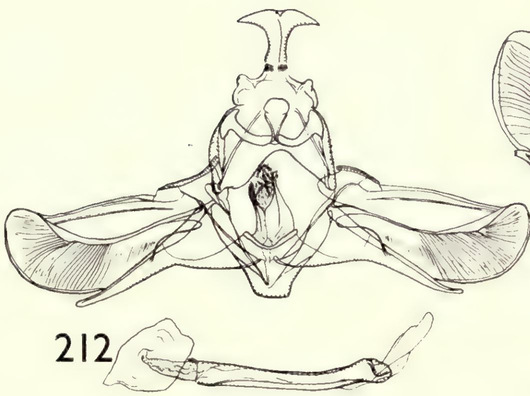

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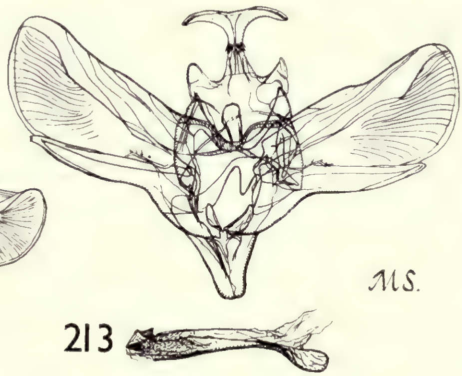

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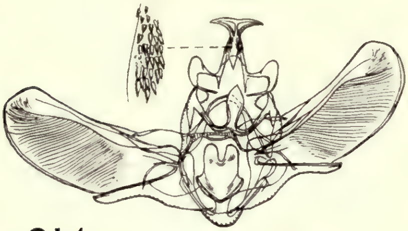
PLATE 23

♂ genitalia

FIG. 214. *E. flavifusalis*
FIG. 215. *E. semirubrica*
FIG. 216. *E. denticostalis*
FIG. 217. *E. conchylaria*
FIG. 218. *E. fuliginosa*
FIG. 219. *E. cruenta*



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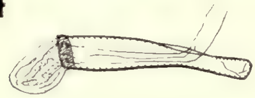

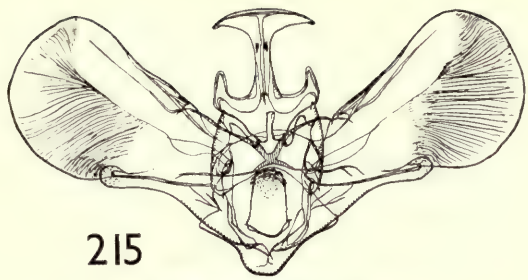

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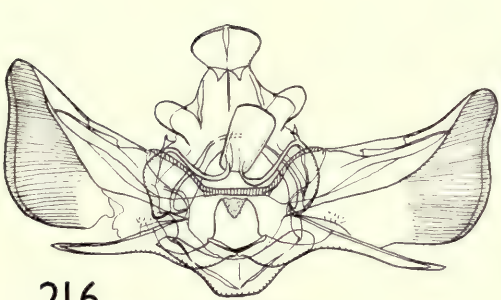

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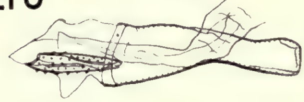

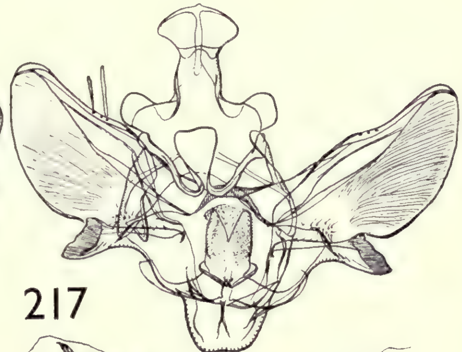

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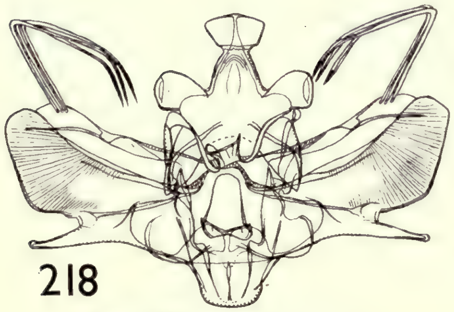

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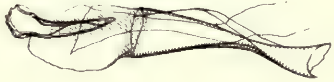

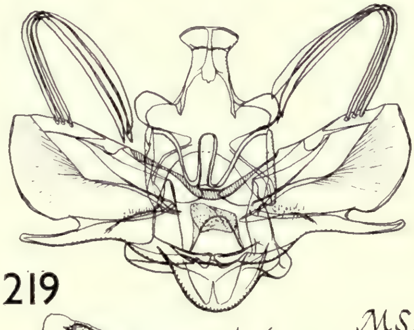

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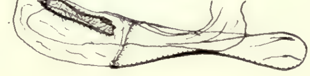

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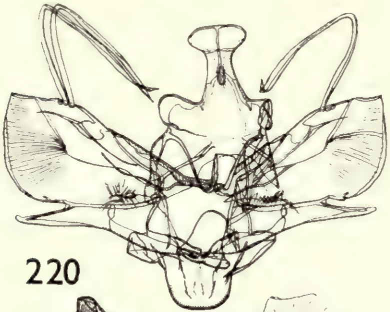
PLATE 24

♂ genitalia

FIG. 220. *E. simplex simplex*
FIG. 221. *E. variabilis*
FIG. 222. *E. simplex rosselli*
FIG. 223. *E. capnospila*
FIG. 224. *E. albicilia*
FIG. 225. *E. encaustalis*



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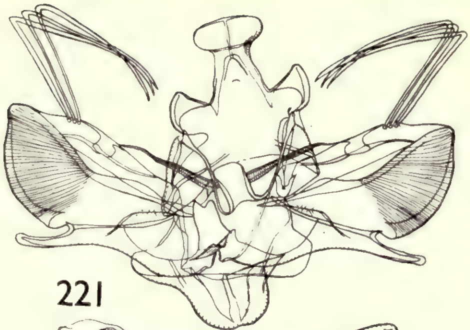

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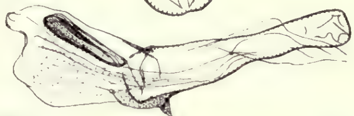

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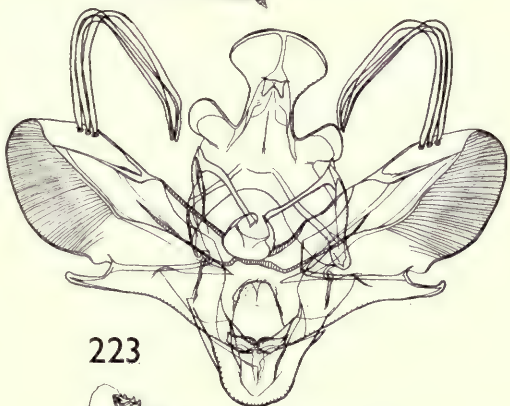

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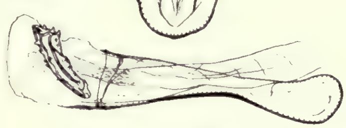

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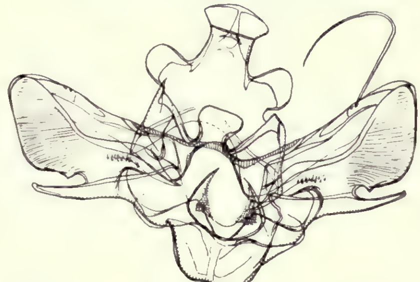

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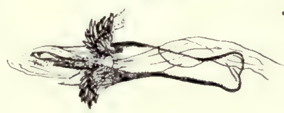

M.S.

PLATE 25

♂ genitalia

FIG. 226. *E. coreacealis*
FIG. 227. *E. luteopuncta*
FIG. 228. *E. dyschroa*
FIG. 229. *E. lobibasalis*
FIG. 230. *E. chionosema*
FIG. 231. *E. peterella*

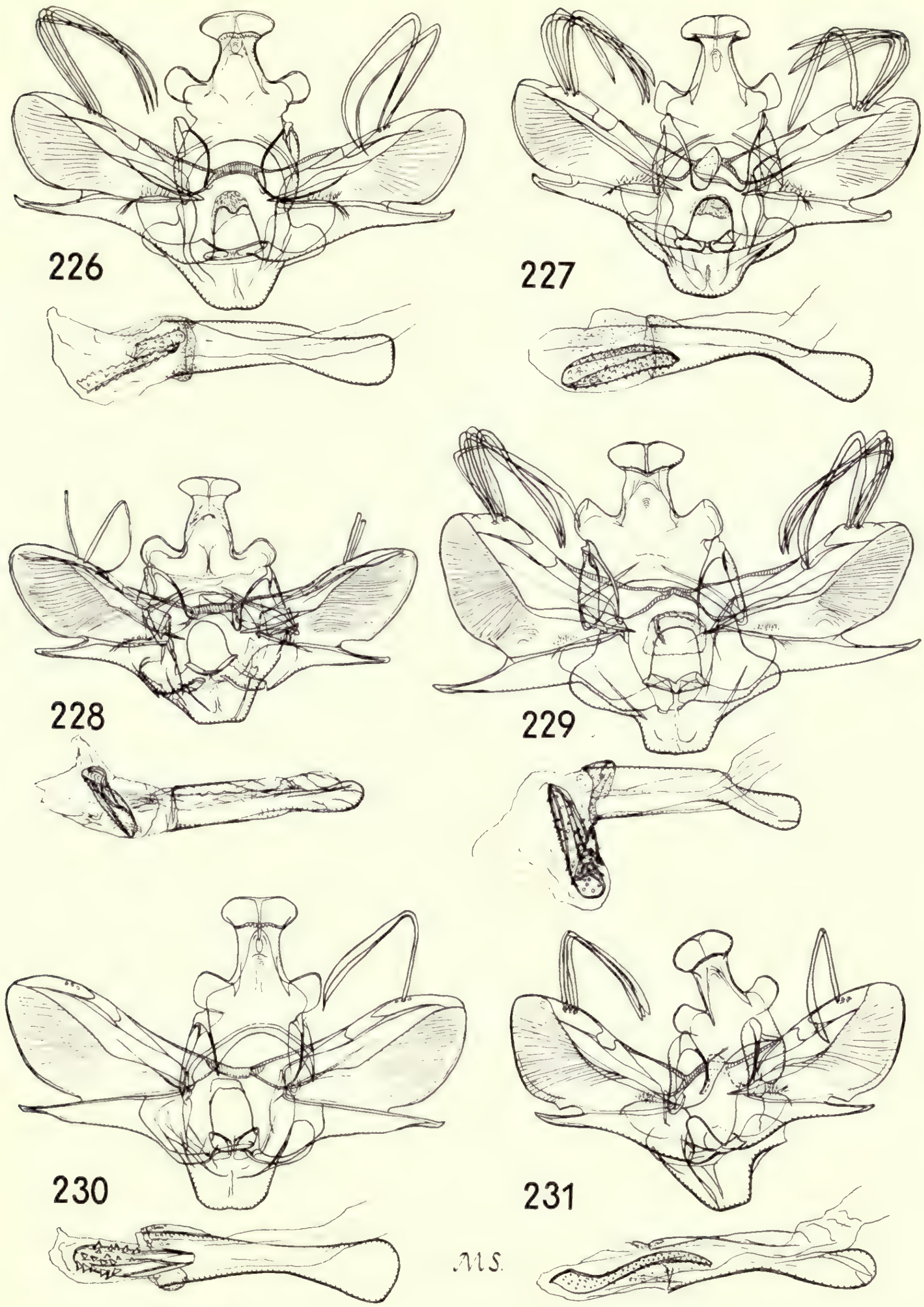
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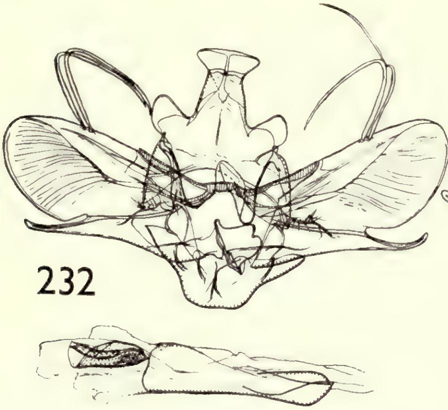
PLATE 26

♂ genitalia

FIG. 232. *E. pyrosalis*
FIG. 233. *E. dispergens*
FIG. 234. *E. nicobaralis*
FIG. 235. *E. approximalis*
FIG. 236. *E. psammitis*
FIG. 237. *E. pyrrhaema*



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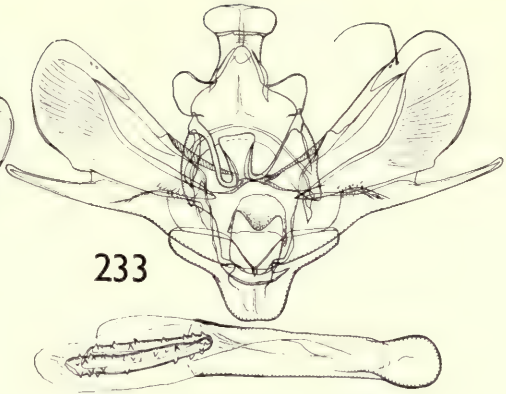

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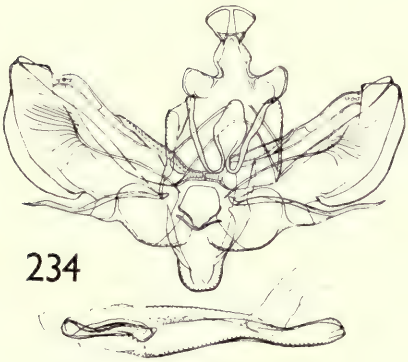

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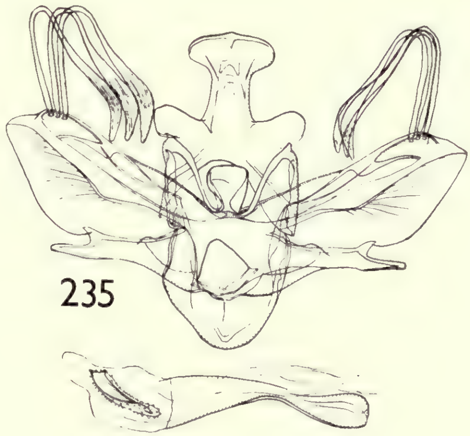

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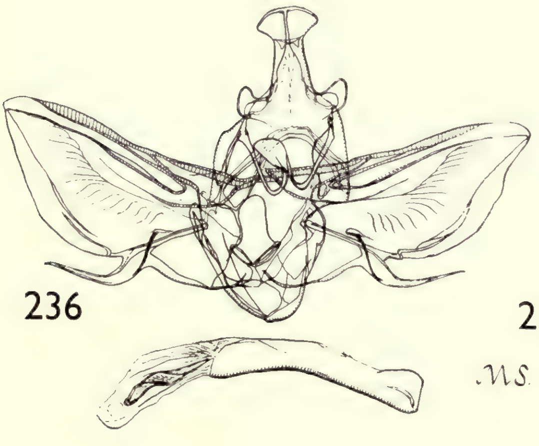

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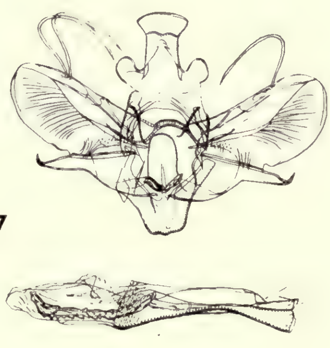

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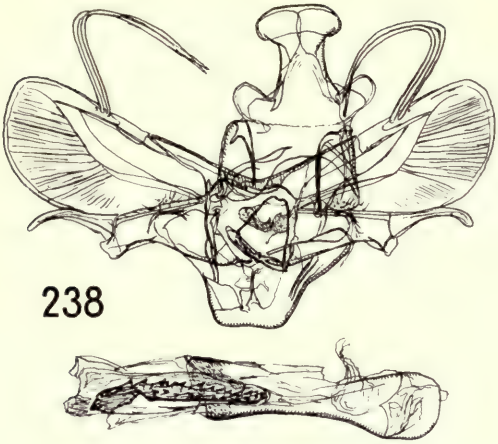
PLATE 27

♂ genitalia

FIG. 238. *E. thermidora*
FIG. 239. *E. separata*
FIG. 240. *E. pyrrhocosma*
FIG. 241. *E. mariana*
FIG. 242. *E. bradleyi*



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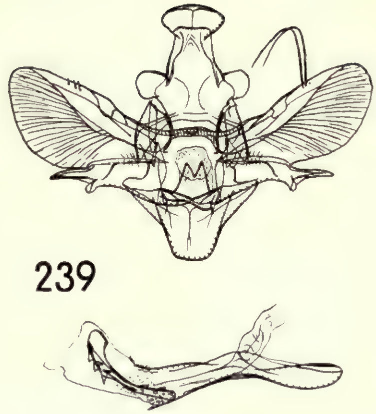

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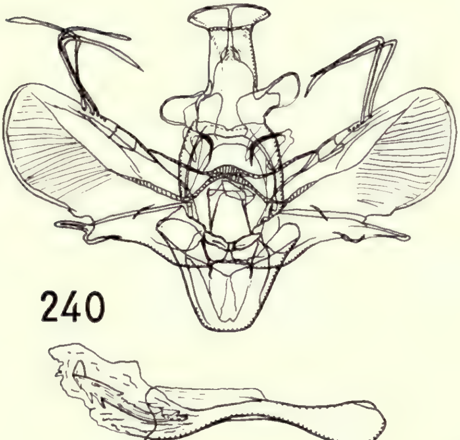

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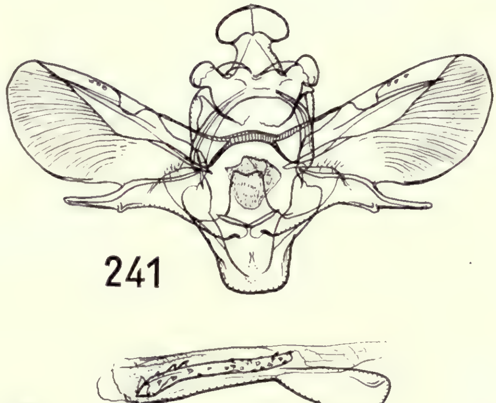

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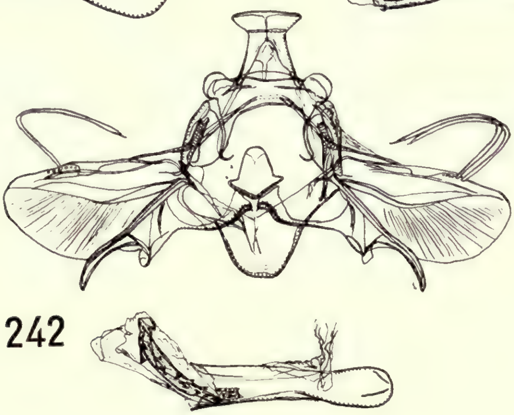

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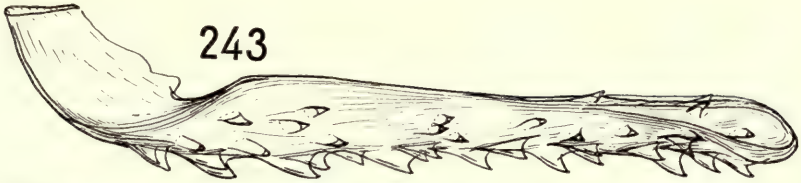
PLATE 28

♂ cornuti and ♀ genitalia

FIG. 243. *E. thermidora*
FIG. 244. *E. separata*
FIG. 245. *E. pyrrhocosma*
FIG. 246. *E. mariana*
FIG. 247. *E. bradleyi*
FIG. 248. *E. nigromaculata*
FIG. 249. *E. consobrinalis consobrinalis*
FIG. 250. *E. puncticostalis*
FIG. 251. *E. niveifimbrialis*



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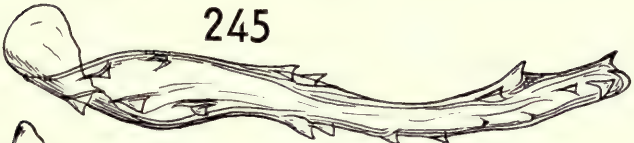

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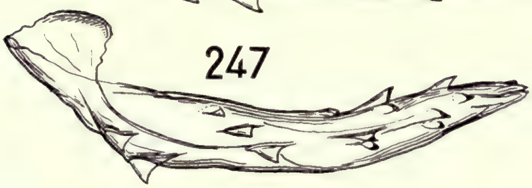

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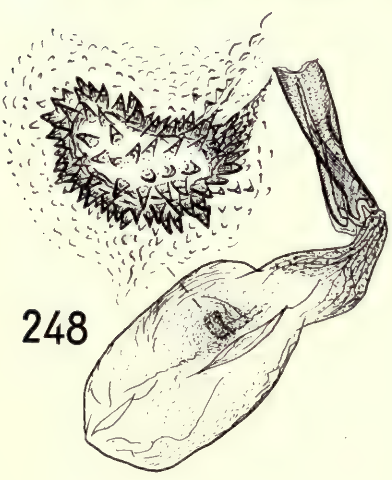

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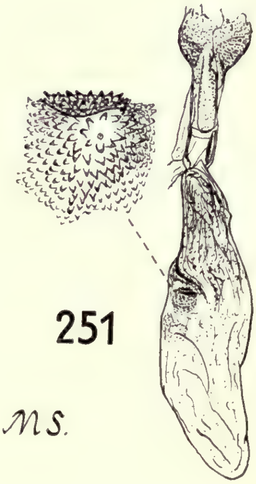

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PLATE 29

♀ genitalia

FIG. 252. *E. flammealis*
FIG. 253. *E. ragonoti*
FIG. 254. *E. consocia*
FIG. 255. *E. decessalis decessalis*
FIG. 256. *E. theonalis*
FIG. 257. *E. melanochroa*
FIG. 258. *E. kuznetzovi*

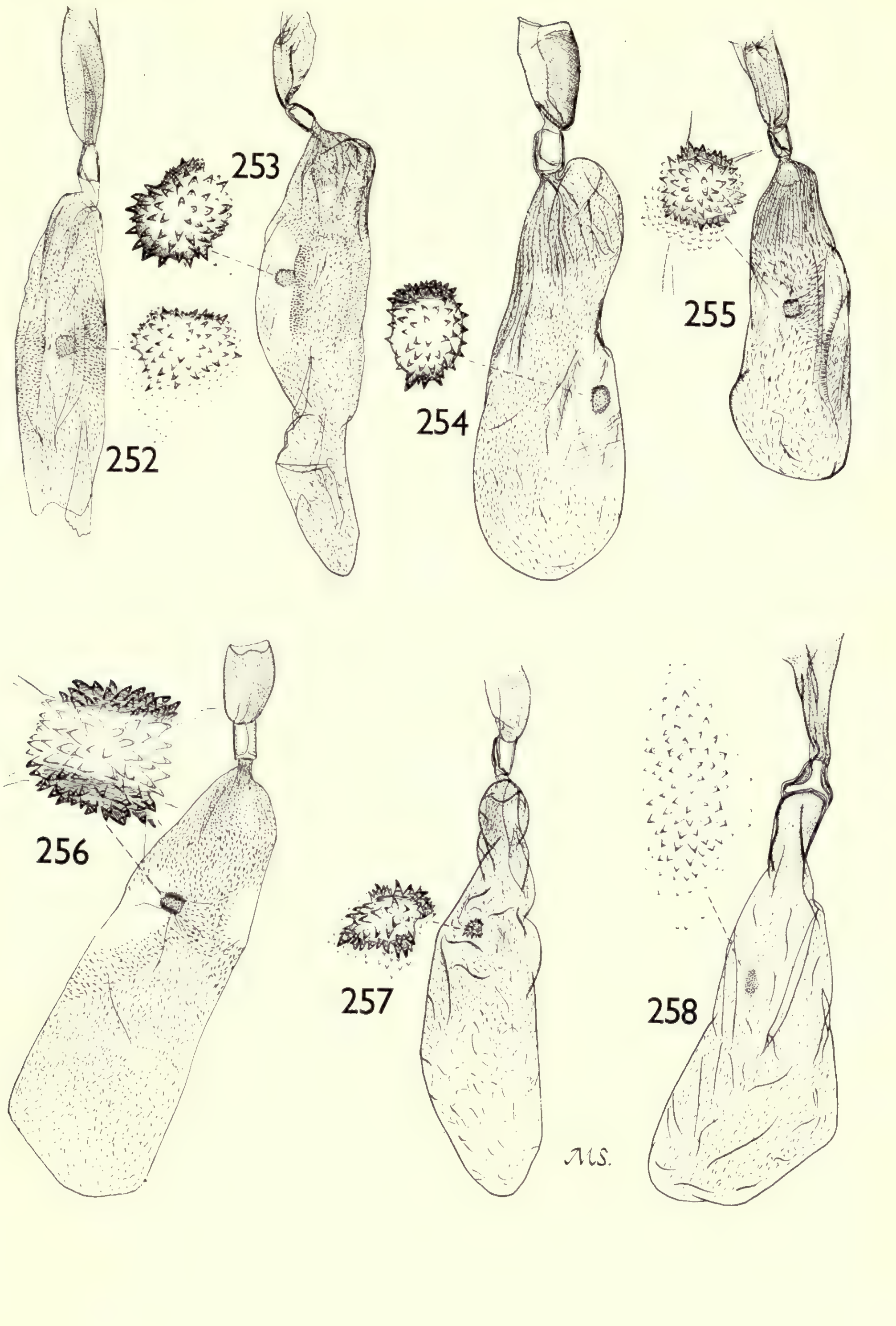
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PLATE 30

♀ genitalia

FIG. 259. *E. flavofascialis*
FIG. 260. *E. icelusalis*
FIG. 261. *E. ruminalis*
FIG. 262. *E. punicea*
FIG. 263. *E. loricata*
FIG. 264. *E. affinitalis*
FIG. 265. *E. wilemani*

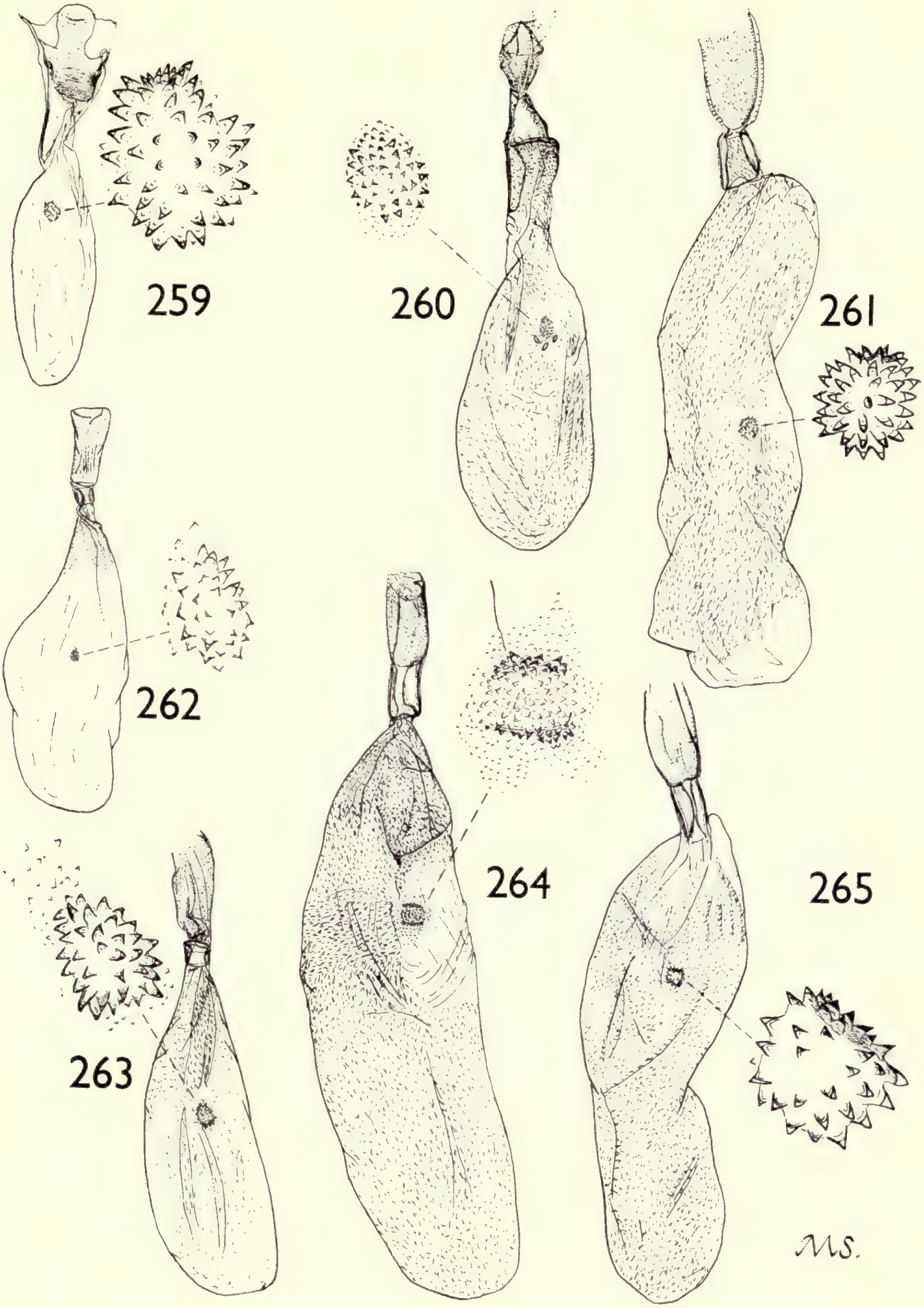
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PLATE 31

♀ genitalia

FIG. 266. *E. rosina*
FIG. 267. *E. ellisoni*
FIG. 268. *E. vinolentalis*
FIG. 269. *E. thomealis*
FIG. 270. *E. altitudinalis*
FIG. 271. *E. erythralis*

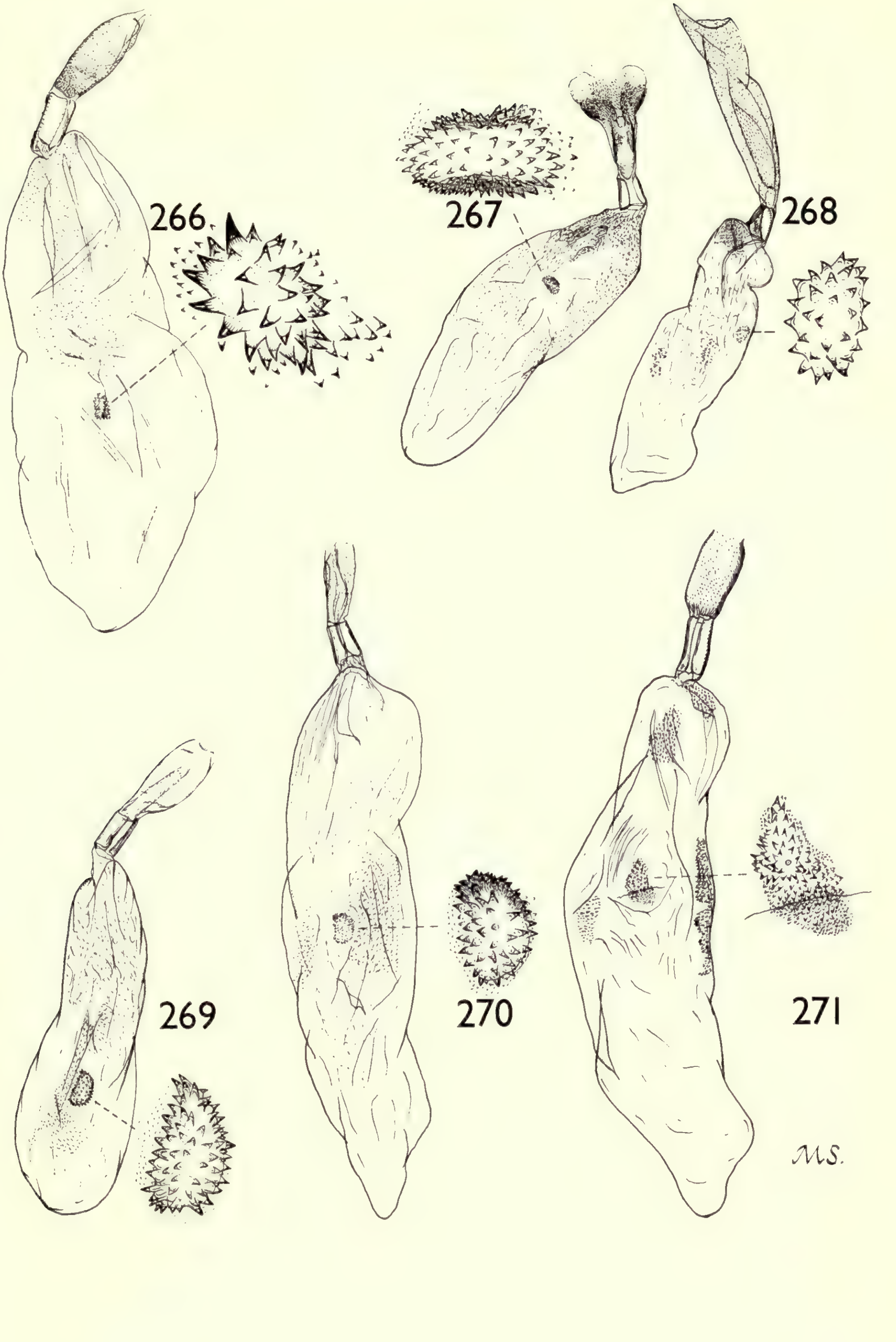
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PLATE 32

♀ genitalia

FIG. 272. *E. ignealis*
FIG. 273. *E. portialis*
FIG. 274. *E. olivacealis*
FIG. 275. *E. propinqua*
FIG. 276. *E. mesenterialis mesenterialis*
FIG. 277. *E. plinthopa*
FIG. 278. *E. costaemaculalis costaemaculalis*

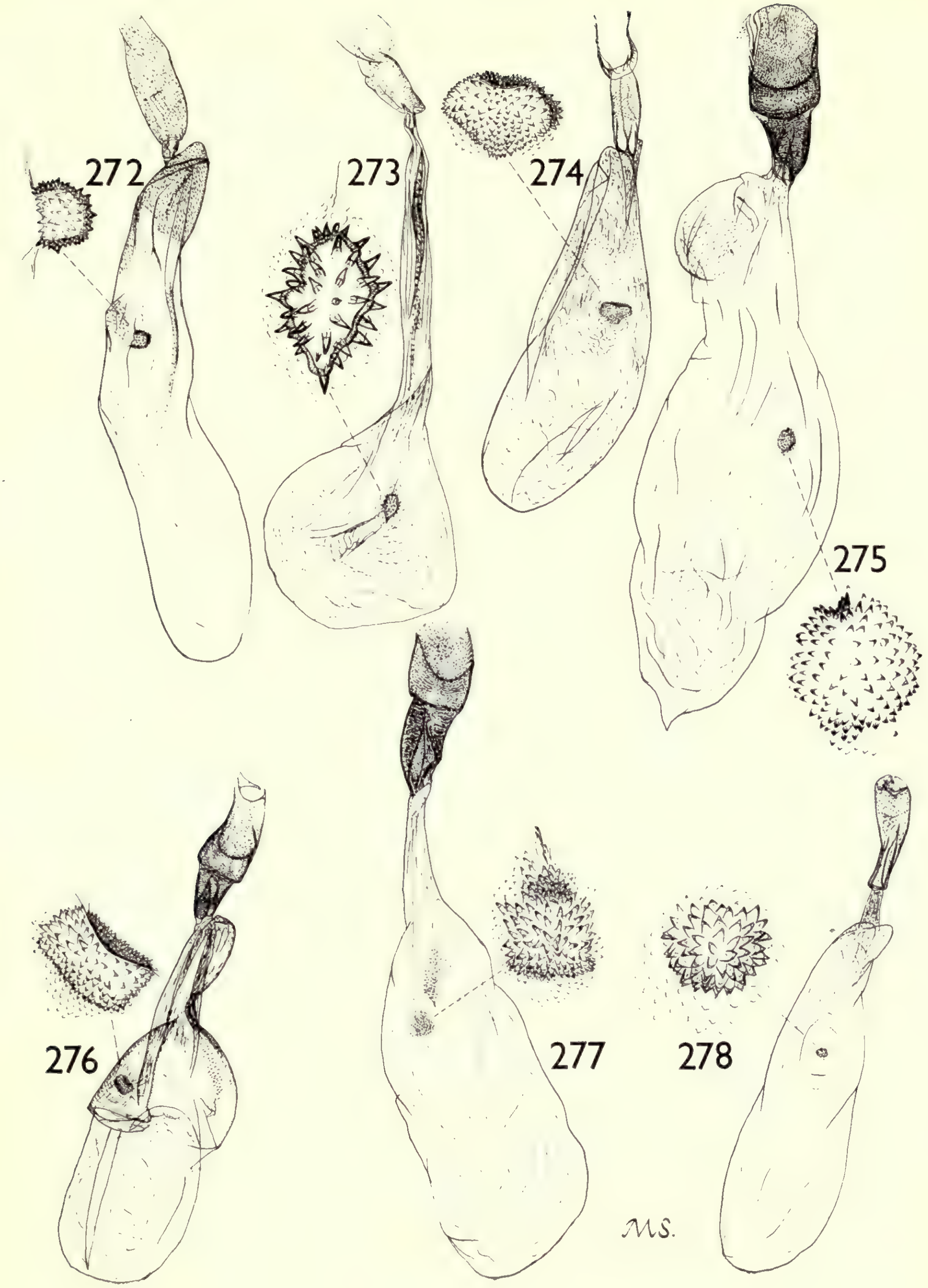
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PLATE 33

♀ genitalia

FIG. 279. *E. eximia*
FIG. 280. *E. argentata*
FIG. 281. *E. similata*
FIG. 282. *E. melanobasis*
FIG. 283. *E. metacuralis*
FIG. 284. *E. ardentalis*
FIG. 285. *E. sondaicalis*
FIG. 286. *E. fastigia*

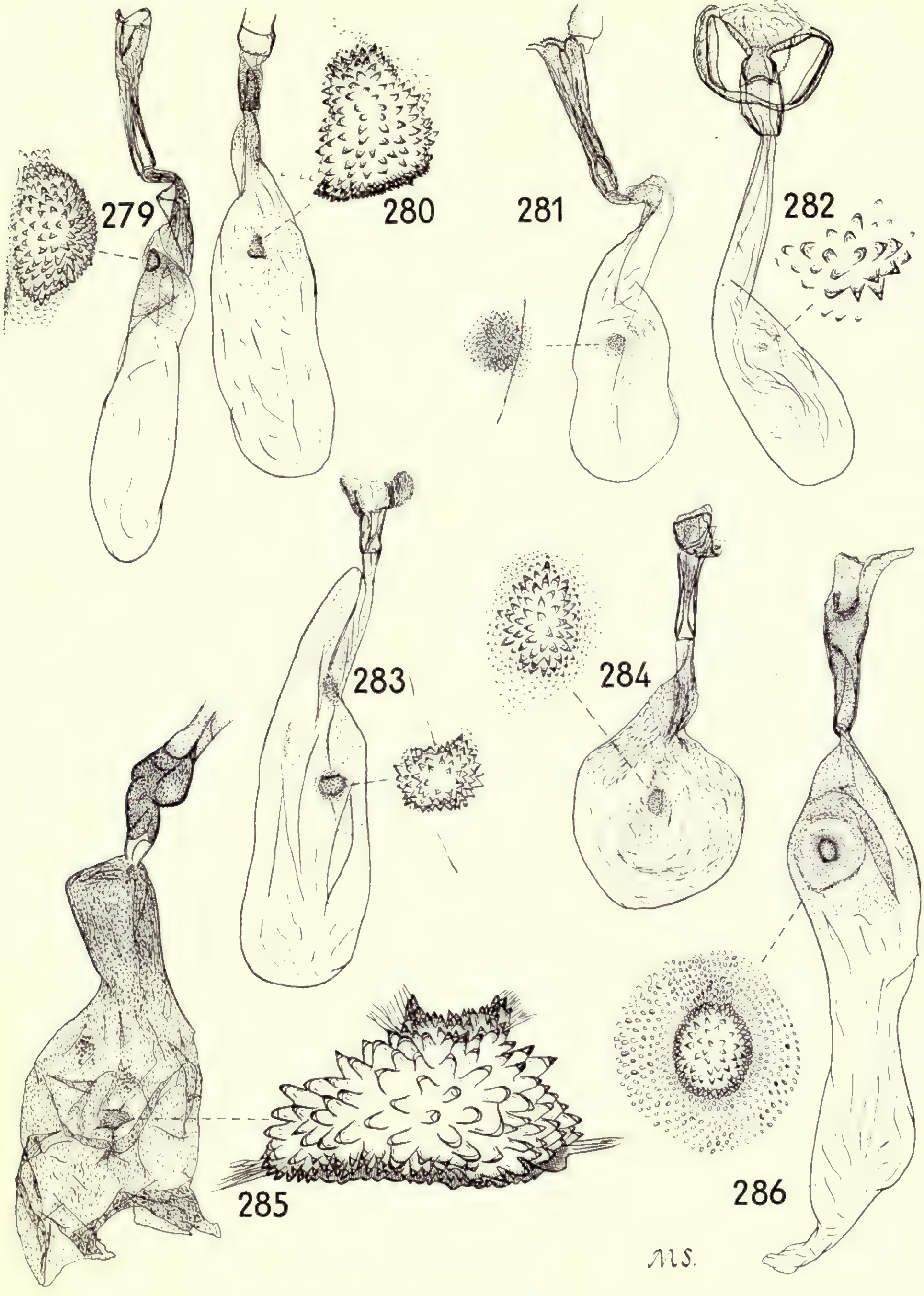
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PLATE 34

♀ genitalia

FIG. 287. *E. faceta*
FIG. 288. *E. borneoensis*
FIG. 289. *E. persicopa persicopa*
FIG. 290. *E. bradleyi*
FIG. 291. *E. aureorufa*
FIG. 292. *E. rhodomicta*
FIG. 293. *E. separata*
FIG. 294. *E. peterella*
FIG. 295. *E. sandaraca*
FIG. 296. *E. psammitis*

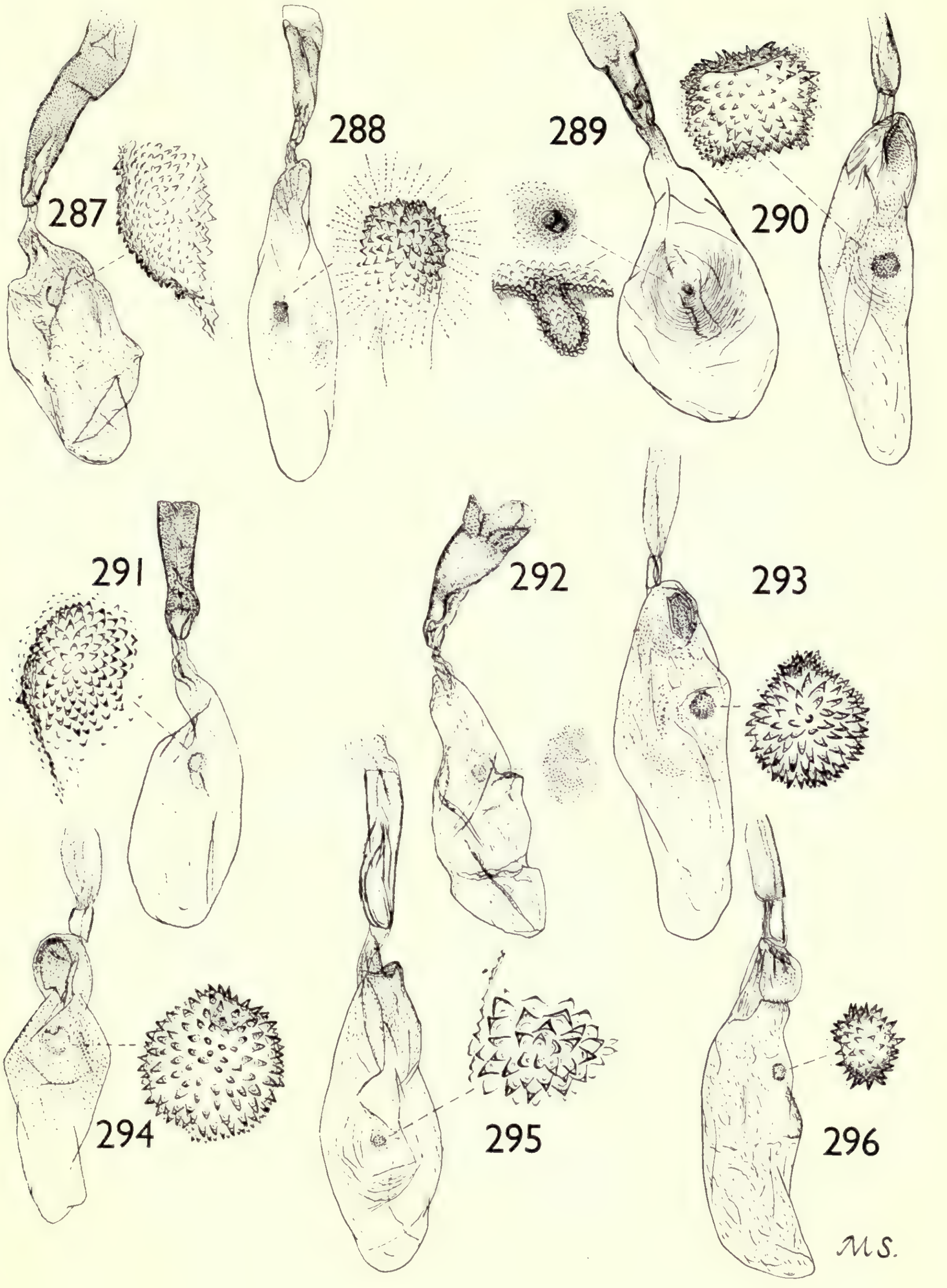
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PLATE 35

♀ genitalia

Fig. 297. *E. flavifusalis*
Fig. 298. *E. munroei*
Fig. 299. *E. rufofimbrialis*
Fig. 300. *E. denticostalis*
Fig. 301. *E. chionocosma*
Fig. 302. *E. capnospila*
Fig. 303. *E. albicilia*

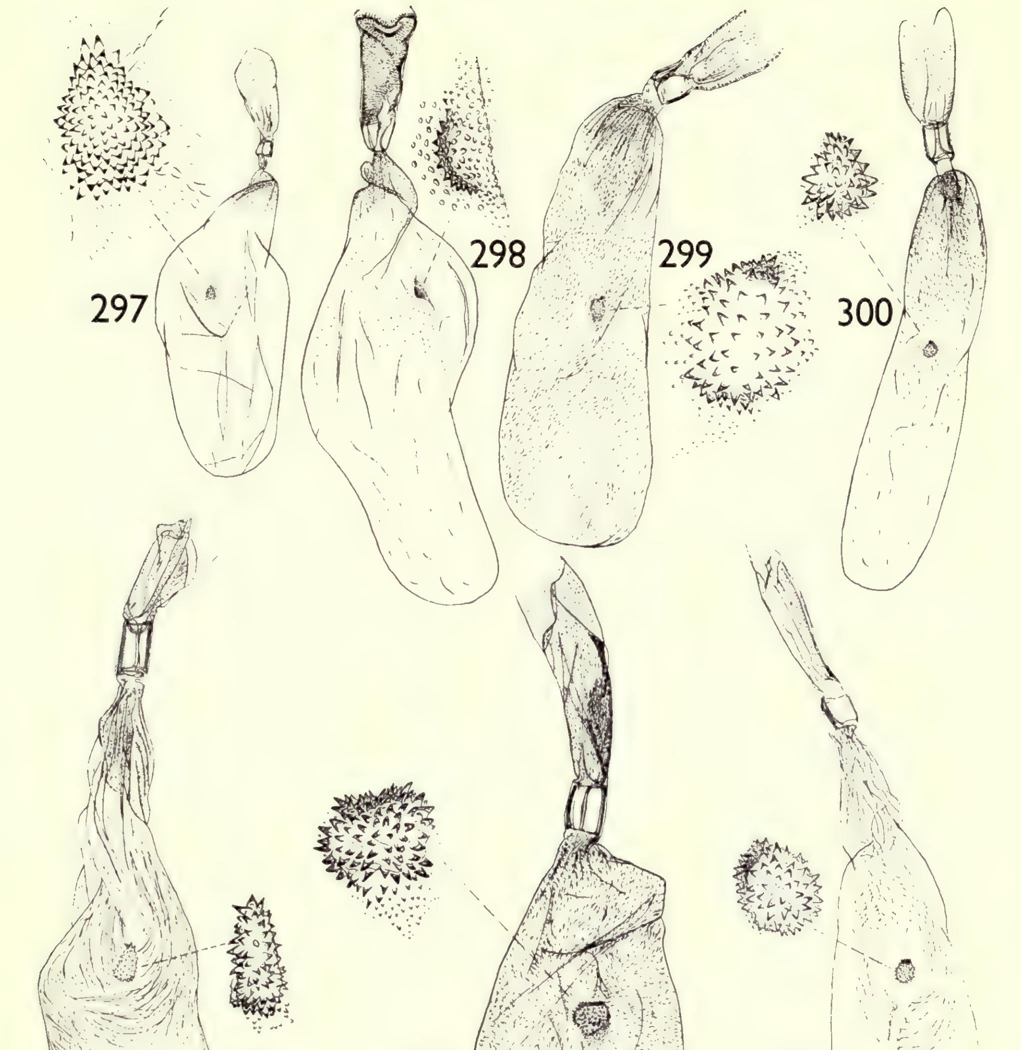
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PLATE 36

♀ genitalia

FIG. 304. *E. variabilis*
FIG. 305. *E. simplex simplex*
FIG. 306. *E. encaustalis*
FIG. 307. *E. chionosema*
FIG. 308. *E. pyrrhaema*
FIG. 309. *E. thermidora*

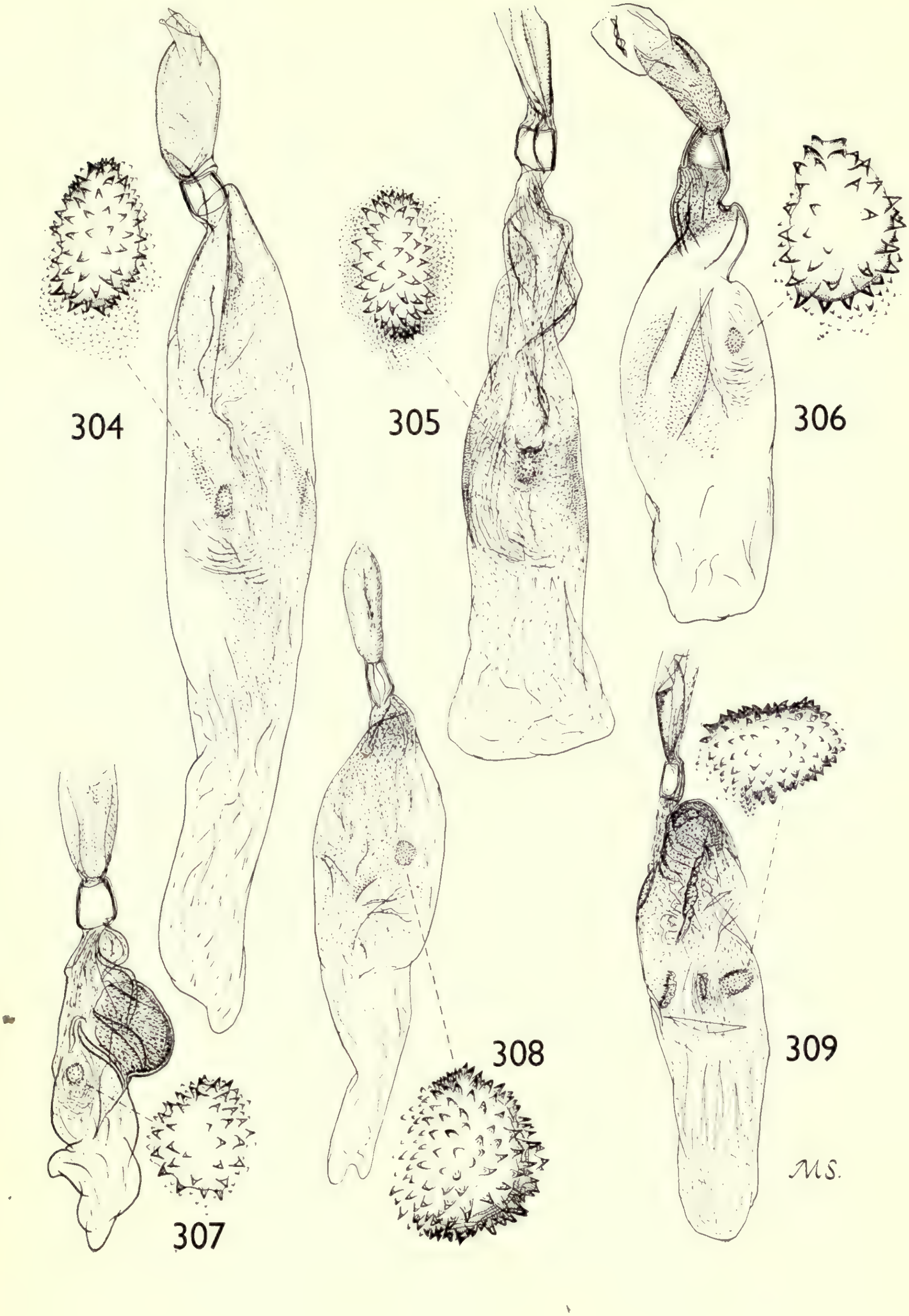
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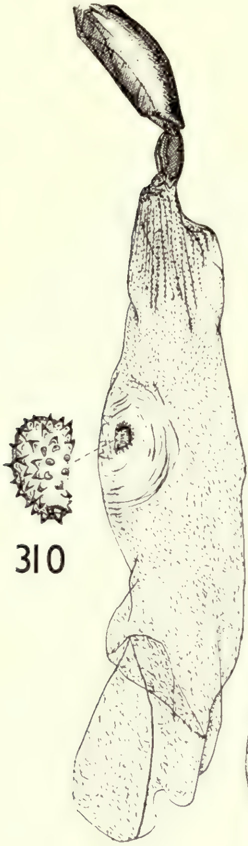
PLATE 37

♀ genitalia

FIG. 310. *E. approximalis*
FIG. 311. *E. dispergens*
FIG. 312. *E. pyrosalis*
FIG. 313. *E. cruenta*
FIG. 314. *E. nicobaralis*



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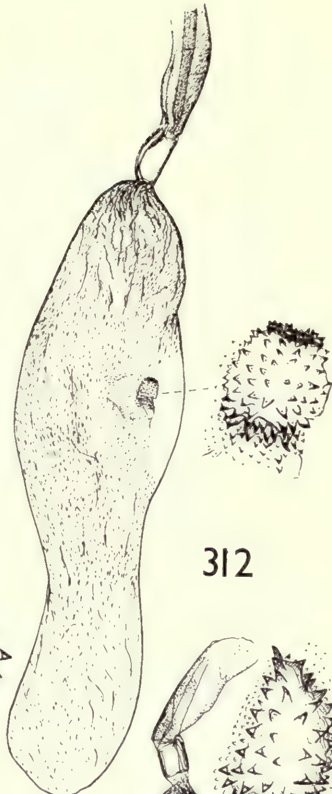

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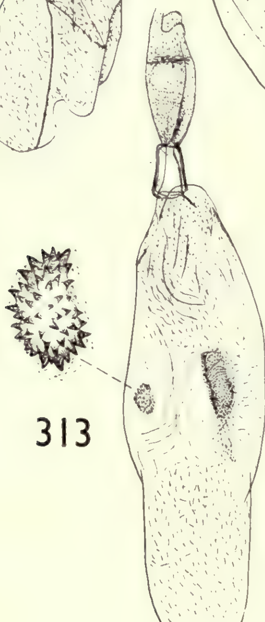

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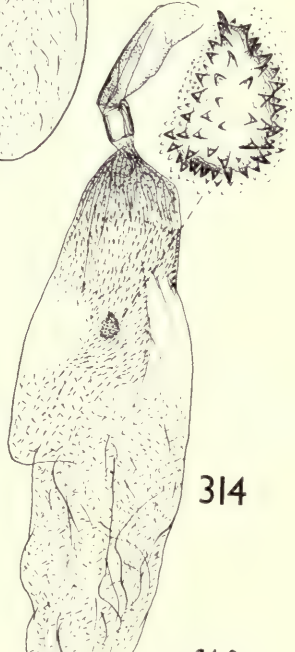

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INDEX TO VOLUME XIII

New taxonomic names are in **bold** type

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